



A revision of *Pompilus* Fabricius (Hymenoptera: Pompilidae), with further nomenclatural and biological considerations

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Synopsis

The genus *Pompilus* Fabricius is redefined to include seven Old World species, of which six are known in both sexes; males of four are described or associated for the first time and a seventh species is described as new from a single female. Keys and distributional data are given. Biology is summarized; that of the type-species is treated at length, including development of the mature larva. One new generic and sixteen new specific synonyms are established and lectotypes are designated for five nominal species; one new combination is made. The nomenclatural histories of alternative family names and of their type-species are summarized and a catalogue of family-group names is given. The possible affinities of *Pompilus* are discussed. For other genera an improperly proposed generic name is made available, a further generic and specific synonymy are established, and three new combinations made; two lectotypes are designated.

Introduction

The spider-hunting robber wasps constitute a family of aculeate Hymenoptera of considerable morphological homogeneity. The family names Pompilidae and Psammocharidae have both at various times been applied to the group in which their type-genera, *Pompilus* Fabricius, 1798 and *Psammochares* Latreille, 1796, have each been used as 'blanket' genera for very large numbers of species. Following issue of Opinion 166 (1945) of the International Commission on Zoological Nomenclature (ICZN), usage has largely stabilized in favour of *Pompilus* and Pompilidae. In order to clarify modern usage for future students, I have thought it worthwhile to give an historical account of nomenclatural applications of *Pompilus* and *Psammochares* and their derivative family names. A catalogue of other extant family-group names is appended for completeness.

In recent years, *Pompilus* has progressively been more rigorously defined such that fewer and fewer species have been assigned to the genus. However, workers have failed to consider the

generic placement of some species thus excluded which are extralimital to their particular regional interest. Such excluded genera and species are all considered here. *Pompilus* is redefined in its most restricted sense, and a preliminary assessment given of the genera to which it is most probably related. No complete account exists of the type-species or its congeners, which are here described and keyed and their distribution summarized. A full account is given of the biology of the type-species since previous reports conflict in certain respects.

I have again in general followed the terminology of Evans (1966); morphological terms are herein abbreviated as follows.

SGP subgenital plate

SMC submarginal cell

Depositories in which material studied is housed have been abbreviated as follows:

AM	Albany Museum, Grahamstown
ANS	Academy of Natural Sciences, Philadelphia
BMNH	British Museum (Natural History), London
BPBM	Bernice P. Bishop Museum, Honolulu
CAS	California Academy of Sciences, San Francisco
MCZ	Museum of Comparative Zoology, Harvard
MHN	Muséum d'Histoire Naturelle, Geneva
MNHN	Muséum National d'Histoire Naturelle, Paris
MNHU	Museum für Naturkunde der Humboldt-Universität, Berlin
MRAC	Musée Royal de l'Afrique Centrale, Tervuren
NMB	Naturhistorisches Museum, Basle
NMR	National Museum of Rhodesia, Bulawayo
NMW	Naturhistorisches Museum, Vienna
NR	Naturhistoriska Riksmuseum, Stockholm
RNH	Rijksmuseum van Natuurlijke Historie, Leiden
RSM	Royal Scottish Museum, Edinburgh
SAM	South African Museum, Cape Town
TMP	Transvaal Museum, Pretoria
TMU	Tokyo Metropolitan University, Tokyo
UM	University Museum, Oxford
USNM	United States National Museum (of Natural History) Washington
UZM	Universitetets Zoologisk Museum, Copenhagen
ZI	Zoological Institute, Leningrad
Colln Empey	Collection of H. N. Empey, Johannesburg
Colln Wahis	Collection of R. Wahis, Chaudfontaine

The nomenclatural history of the family name

The first spider wasps described were placed by Linnaeus (1758) in his genus *Sphex*. Latreille (1796), in proposing *Psammochares* and *Ceropales*, recognized two fundamental groupings of these wasps and differentiated them from *Sphex* s.l. He diagnosed the groups but included no species. Fabricius (1798) proposed *Pompilus* for a group of 37 species, mostly spider-hunting wasps, which he stated was 'Genus Sphegibus nimis affine'. The subsequent nomenclatural history of *Psammochares* and *Pompilus* is confused, hingeing on two problems; firstly, the seniority and availability of the names, and secondly, the type-species designations for the genera and their identities. I hope the following is both a definitive and a fair account which will explain the present application of the name *Pompilus* and clarify aspects of the nomenclatural history not presently well documented.

Psammochares and *Psammocharidae* versus *Pompilus* and *Pompilidae*

Latreille (1802-3: 334) diagnosed *Pompilus* and wrote 'Exemple, *Pompilus viaticus* F. Remarq. J'avais établi le premier ce genre sous le nom de *psammochare*. J'abandonne volontiers cette dénomination pour prendre celle de *pompile*, qui est plus douce à l'oreille'. Subsequently (1803b:

158) he gave a similar account, but in more detail. Part of this account has been quoted by Pate (1946), but he failed to quote the last four sentences, as follows. 'M. Fabricius en sépara ces insectes disparates; mais il n'épura pas encore parfaitement le genre, puisqu'il y laissa des insectes qui ont bien des très-grands rapports avec les *sphex*, mais dont les parties de la bouche sont très-différents, *sphex sabulosa*, *sphex fusca*. J'entrepris de terminer la réforme et je créai le genre *psammochare* (qui aime le sable), en prenant pour type le dernier insecte que je viens de citer [Pate's quotation concludes]. Kirby, en Angleterre, s'est occupé peu de temps après, et sans connaitre mon travail, du même sujet. Il a donné le nom d'*ammophile* aux *sphex* de M. Fabricius qui ont leurs machoires et leur lèvre inférieurs allongées, fléchies. L'entomologiste de Kiell a fait de mes *psammochares* des *pompiles*, et son genre *sphex* à cette séparation près, est resté le même. Je viens de le restreindre . . . '.

It is clear that Latreille's primary objective was the definition of two distinct but similar groups of fossorial Hymenoptera. However he anticipated the possible confusion that might result from the proposal by Kirby (1798) of a name for one of the groups which meant the same as that proposed by Latreille himself for the other, i.e. *Ammophila* and *Psammochares*, 'sand lover'. In rejecting both these names, and employing the names used by Fabricius, Latreille was of course not in accord with current nomenclatural procedure. However, as a pioneer of many aspects of taxonomic practice, the act was laudable as one of selfless rejection of his own proposal in order to reduce confusion to a minimum. This seems not previously to have been understood as such; previous authors have noted only Latreille's remarks concerning the euphony of *Pompilus* compared with *Psammochares*.

Most early authors followed Latreille unquestioningly; few chose even to cite *Psammochares* as a synonym of *Pompilus*. Throughout the nineteenth century hundreds of species names were proposed in *Pompilus*, which was also employed as the stem of the family name Pompilidae, despite the fashion for employing the oldest included genus, in this case *Ceropales* Latreille, 1796. In 1901, Fox stated his belief that *Pompilus* was preoccupied in the Cephalopoda by a supposed genus *Pompilus* Schneider, 1784. In the first decade of this century *Aporus* Spinola, 1808 and *Ceropales* Latreille were each on occasion employed for the traditional blanket genus *Pompilus*, and Aporidae and Ceropalidae were both employed as family names. However, in 1910 Banks resurrected *Psammochares* and based a family name Psammocharidae on it. In the two subsequent decades, substantial progress was made in the taxonomy of spider wasps, with virtually all important contributions employing *Psammochares* and Psammocharidae. However, the identity of the type-species had not properly been elucidated. No author (save Banks in his last works) employed the generic name for the group to which it should properly have been applied other than as a blanket genus-name approximating to the present tribe Pompilini. Nevertheless, it was the earliest available name, valid under the law of priority.

In 1935, the ICZN considered a general petition concerning hymenopterous names, initiated in 1928 by J. C. Bradley and bearing 59 other signatures, requesting various actions under suspension of the rules, including the suppression of *Psammochares*, the validation of *Pompilus*, and designation of a type-species for the latter. No specific reason was given for the proposed action; one is left to infer that the substitution of *Psammochares* for *Pompilus* had been a bad thing! This unfortunate petition was to result in the issue of several opinions of which no. 166 (1945) adopted the course submitted for *Pompilus*. The history of this case and its needless consequences are a lesson in the pitfalls that attend those who would suspend the rules of nomenclature. Townes (1957a; 1969) has expounded at length credible reasons for regarding as invalid the opinions resulting from the 1935 Lisbon International Congress of Zoology, at which Bradley's petitions were first considered. The submission was insufficiently advertised in advance of the Lisbon congress, at which the ICZN decided in principle to suspend the rules. During the congress material changes were made to the original submission (substitution of *P. pulcher* F. for *S. viatica* L. as type-species, for reasons explained below). Finally, following subsequent sufficient advertisement, objections were received from the committee on nomenclature of the Entomological Society of Washington and from C. D. Michener. The latter stated succinctly '*Psammochares* is the name now in general use and is correct without a suspension of the rules'. Nonetheless, it was judged that no new material evidence had been presented and in 1945 the Lisbon decision was given effect over

the signature of the secretary, F. Hemming, without further reference to the Commissioners. He appended a scholarly refutation of the existence of the spurious homonym, *Pompilus* Schneider, which was shown to be a trivial name combined with *Octopodia* Schneider, and thus also of no relevance to the case.¹ Despite the inutility of the decision and the unsatisfactory nature of its promulgation, most subsequent works save those of Banks (1946), Pate (1946) and Townes (1957a; 1957b; 1973) have followed Opinion 166.

Resubmission of the case to the ICZN would not be without precedent. The names *Sphex* and *Ammophila* were subject of an Opinion, no. 32 (1910), which ruled on the identities of their type-species, but without suspension of the rules. Subsequently, this Opinion was superseded by Opinion 180 (1946) which suspended the rules in order to alter the applications previously decreed. However, it is likely that any reconsideration of the controversial Lisbon decisions by the ICZN would take account of usage subsequent to the issue of the Opinion(s) in question, which thus offers little hope of a remedy. Where a dichotomy of interpretation exists, a final solution must necessarily be arbitrary; I therefore follow the existing majority practice, with the proviso that the lessons of this nomenclatural tangle be learned. These are, simply that reference to the ICZN should be a last resort, required only when application of the *Code* gives no solution to intractable problems. In particular, thorough scholarship is essential in determining all aspects of the case in order to anticipate further ramifications. Many submissions relate to nomenclatural inconveniences that are of a purely temporary nature in terms of potential future usage. Only those who view the future of mankind with extreme pessimism have real grounds for consideration of current expediency as a basis for future stability – and such pessimists have little future need of zoological nomenclature in any event.

The type-species of the type-genera

The previous paragraphs relate the sequence of applications of generic and suprageneric names without reference to the precise identities of those entities. The following considerations are rendered redundant by Opinion 166, but for the sake of historical clarity are given in detail.

As previously stated, Latreille (1796) included no species in *Psammochares*, whilst Fabricius (1798) included 37 in *Pompilus*. Latreille later (1802–03: 334–335) equated his *Psammochares* with *Pompilus* and by implication included in it the 37 species of Fabricius. He cited *S. viatica* 'F' as an 'Exemple'. On p. 332 of the same work, under '*Sphex* alongés' he cited *S. arenaria* F. as an 'Exemple' of one part of this group of sphecids; this species was later differentiated by him (1809) from *S. viatica* 'F.', but shown to be the same as '*S. viatica* L.' of authors such as DeGeer. Most authors have rejected Latreille's 'Exemple' as valid type-species designation, save in Latreille (1810) (ICZN Opinion 11, 1910). Latreille (1803b: 158) wrote the passage quoted earlier at length, in which 'en prenant pour type le dernier insecte' (*Sphex fusca* L.) he again chose a species clearly to be interpreted as a spider-wasp. He had earlier (1803a: 354–355) confused several entities but with no contained type-species designation. Later (1805: 280) he cited nine species in *Pompilus*, all undoubtedly spider-wasps. Fabricius (1804: 187 *et seq.*) placed 63 species of diverse affinities, but predominantly spider-wasps, in *Pompilus*. His twelfth species, *viaticus*, had the mouth parts described in detail. Malaise (1937) has given reasons for regarding this as a type-species designation for *Pompilus*; however, this view is not current. Finally, Latreille (1809: 55) clarified the situation with regard to *S. viatica* L. and *S. viatica* 'F.' Thus, of the possible acceptable type-species designations for *Pompilus*, none is of a species which is not now interpreted as a spider-wasp, or as a deliberate misidentification of one (*S. viatica* 'F.'). Thus, under current rules, there is no nomenclatural mechanism to prevent application of the name to a group of spider-wasps. I incline to the view that Latreille (1803b) designated *S. fusca* L. type-species of *Psammochares*, in which he had earlier included Fabricius's 37 species by reason of his effective replacement of *Psammochares* by *Pompilus*; he may thus be judged simultaneously to have designated a type-species for *Pompilus*. Nevertheless, Pate (1946) argued that *Pompilus* should be applied as a genus in the Sphecidae, since he believed *S. viatica* L. to be designated type-species, and he interpreted this to be the species currently known as *Podalonia hirsuta* (Scopoli). It is certainly

¹ *Octopodia pompilus* (L.) Schneider [*Nautilus pompilius* L., 1758]; other Schneider names of 1784 are suppressed by ICZN Opinion 233, 1954.

because of this controversy that, at the last minute, the type-species cited in Bradley's petition to the ICZN on *Pompilus* (*S. viatica* L.) was changed to *P. pulcher* F. This latter was probably selected because Šusterka (1912) had in error cited *S. plumbea* F. as type-species of *Psammochares*! *S. plumbea* was not an originally included species in *Pompilus*, but *P. pulcher*, a synonym, was. Subsequent authors of important works, such as Haupt (1927), had followed this usage. It is unfortunate that no type-specimen exists for this taxon, the ultimate basis of the family name.

Townes (1973) reiterated and developed Pate's views. I have elsewhere (1979a; 1979b) given an account of the history of *Sphex viatica* and *Sphex fusca*. I do not doubt that, in the absence of Opinion 166, both *Psammochares* and *Pompilus* (type-species *Sphex fusca* L. [= *Anoplius viaticus* (L.) of current usage]) would be senior names for the genus currently known as *Anoplius* Dufour and within this group for the subgenus *Arachnoproctonus* Howard (= *Pompilinus* Ashmead). The ICZN (1980) has since issued Opinion 1157, ruling on the validity of conflicting lectotype designations for *Sphex viatica* L.

The family-group names of the Pompilidae

Much of the work produced on this family has dealt with local faunas, and the classifications employed have thus tended to be superficial assessments. Certain recognizable kinds of morphology (which often prove to be parallel developments in different zoogeographic regions) have at various times been recognized as suprageneric categories. The names employed for these categories have often been proposed without reference to previously available names or, occasionally, have been re-proposed independently. Often one name has been applied by different authors to groups with little or nothing in common. The classification of the Pompilidae is not yet at a stage which permits stable employment of these names; few groups are well defined save perhaps the currently recognized subfamilies Pompilinae, Pepsinae and Ceropalinae. However, since these names are relatively few in number, they are here listed in chronological order as a guide for other workers. This should facilitate their subsequent correct employment provided the *International Code of zoological Nomenclature* is followed. Subsequent usages and independent subsequent proposals are not listed.

Pompilii Latreille, 1805: 277. Type-genus: *Pompilus* Fabricius, 1798 (Pompilidae).

Most past workers have credited Leach (1815) with authorship of this group-name, despite the fact that Latreille first applied suprageneric names in the Hymenoptera based on the stem of an included genus. In the introduction (p. vj) of volume 3 of his *Histoire naturelles* (1802–03), he wrote '... j'ai créé d'autres coupes générales, et plusieurs nouveaux genres; j'ai surtout donné le premier, en cette partie, l'idée d'une division par familles'. On p. x, 'La dénomination des familles que j'ai cru devoir former est composée du nom du genre dominant, et d'une finale. Il faut soulager la mémoire et ne pas surcharger sans nécessité la nomenclature'. In 1805, he employed Pompilii as a latinization of *Pompilus* and gave 'Pompiliens' as a vernacular name. He included the genera *Thynnus* F., *Pompilus* F. and *Ceropales* Latreille. I have no hesitation in recognizing Latreille, 1805 as author of the family name Pompilidae (Article 36, *Int. Code zool. Nom.*).

Aphorida (sic) Leach, 1815: 149. Type-genus *Aporus* Spinola, 1808. (Aporini).

An incorrect original spelling of Aporida Leach.

Pepsites Lepeletier, 1845: 464. Type-genus: *Pepsis* Fabricius, 1804 (Pepsinae).

Ceropalidae Radoszkowski, 1888: 489. Type-genus: *Ceropales* Latreille, 1796.

Notocyphini Fox, 1894: 296. Type-genus: *Notocyphus* Smith, 1855.

[Ageniinae Ashmead, 1900: 154. Type-genus: *Agenia* Schiødte, 1837.]

Unavailable; based on a junior homonym of *Agenia* Dezcourtiz, 1825.

Planicepinae Ashmead, 1900: 155. Type-genus: *Planiceps* Latreille, 1825 [= *Aporus* Spinola, 1808].

Anopliini Ashmead, 1902: 80. Type-genus: *Anoplius* Dufour, 1834.

Homonotini Ashmead, 1902: 131. Type-genus: *Homonotus* Dahlbom, 1843.

Chirodamini Ashmead, 1902: 135. Type-genus: *Chirodamus* Haliday, 1837.

[Psammocharidae Banks, 1910: 114. Type-genus: *Psammochares* Latreille, 1796.]

Suppressed by ICZN Opinion 166, 1945.

Ageniellini Banks, 1912: 222. Type-genus: *Ageniella* Banks, 1912.

Deuteragenini Šusterka, 1912: 176. Type-genus: *Deuteragenia* Šusterka, 1912 [= *Dipogon* Fox, 1897].

Macromerinae Haupt, 1927: 23. Type-genus: *Macromeris* Lepeletier, 1831.

[Claveliinae Haupt, 1929: 111. Type-genus: *Clavelia* Lucas, 1851.]

Permanently rejected under Article 40, *Int. Code zool. Nom.* through supposed synonymy of type-genus; see Ctenocerinae Arnold, 1934b [1929].

[Pedinaspinae Haupt, 1929: 112. Type-genus: *Pedinaspis* Kohl, 1884 [= *Entomobora* Gistel, 1857].]

Permanently rejected under Article 40, *Int. Code zool. Nom.* through synonymy of type-genus; see Entomoborini Pate, 1947 [1929].

[Platyderini Haupt, 1929: 112. Type-genus: *Platyderes* Guérin-Méneville, 1844 [= *Ferreola* Lepeletier, 1845].]

Unavailable: based on a junior homonym of *Platyderes* Stephens, 1827; see Ferreolini Priesner, 1969.

Epipompilini Haupt, 1930: 724. Type-genus: *Epipompilus* Kohl, 1884.

Psilotelini Arnold, 1932: 44. Type-genus: *Psilotelus* Arnold, 1932.

Ctenocerinae Arnold, 1934b [1929]: 386. Type-genus: *Ctenocerus* Dahlbom, 1845.

Replacement name for Claveliinae Haupt, 1929, q.v.

Cryptocheilinae Banks, 1934: 4. Type-genus: *Cryptocheilus* Panzer, 1806.

Hemipepsini Banks, 1934: 5. Type-genus: *Hemipepsis* Dahlbom, 1843.

[Pseudageninae Banks, 1934: 31. Type-genus: *Pseudagenia* Kohl, 1884.]

Permanently rejected under Article 40, *Int. Code zool. Nom.* through synonymy of type-genus: see Auplododini Pate, 1946.

Priocnemini Banks, 1934: 31. Type-genus: *Priocnemis* Schiødte, 1837.

Eidopompilini Arnold, 1936a: 73 (as Idopompilini) Type-genus: *Eidopompilus* Kohl, 1899.

Haupt (1930) made the emendation *Idopompilus* of Kohl's genus *Eidopompilus*; Arnold based his tribal name on Haupt's unjustified emendation.

[Calicurgini Haupt, 1937: 66, 69. Type-genus: *Calicurgus* Lepeletier, 1845.]

Unavailable; based on a junior homonym of *Calicurgus* Brullé, 1833.

Cordyloscelini Arnold, 1937: 75. Type-genus: *Cordyloscelis* Arnold, 1935.

Teinotrachelini Arnold, 1937: 75. Type-genus: *Teinotrachelus* Arnold, 1935.

Psammoderini Arnold, 1937: 76. Type-genus: *Psammoderes* Haupt, 1929.

Pseudopompilini Arnold, 1937: 76. Type-genus: *Pseudopompilus* Costa, 1887.

Tachypompilini Arnold, 1937: 76. Type-genus: *Tachypompilus* Ashmead, 1902.

Spuridiophorini Arnold, 1937: 77. Type-genus: *Spuridiophorus* Arnold, 1934.

Apinaspini Banks, 1938: 238. Type-genus: *Apinaspis* Banks, 1938.

[Ctenoceratini Bradley, 1944a: 30. Unjustified emendation of Ctenocerinae Arnold, 1934b [1929] q.v.]

Allocharini Bradley, 1944a: 29, 147. Type-genus: *Allochaes* Banks, 1917.

Allocyphonychini Bradley, 1944a: 29, 150. Type-genus: *Allocyphonyx* Ashmead, 1902 [= *Paracyphonyx* Gribodo, 1884].

Anoplageniini Bradley, 1946: 125. Type-genus: *Anoplagenia* Bradley, 1946 [= *Priochilus* Banks, 1944].

Auplododini Pate, 1946 [1934]: 117. Type-genus: *Auplopus* Spinola, 1841.

Replacement name for Pseudageninae Banks, 1934, q.v.; however, Pate referred to a subsequent erroneous usage of Pseudageniini (Bradley, 1944b). Bradley had confused *Pseudagenia* and *Deuteragenia*! Pate did not note the confusion.

Pilpomini Pate, 1946: 117. Type-genus: *Pilpomus* Costa, 1859 [= *Auplopus* Spinola, 1841].

Alternative, conditionally proposed, to Auplododini Pate, q.v.

Pedinaspinae Pate, 1947: 18. Emendation of Pedinaspinae Haupt, 1929.

Entomoborini Pate, 1947 [1929]: 18. Type-genus: *Entomobora* Gistel, 1857.

Replacement name for Pedinaspinae Haupt, 1929, q.v.

[Paraferreolini Haupt, 1949: 65, 73. Type-genus: *Paraferreola* Šusterá, 1912.]

Paraferreola Šusterá is based on a misidentified type-species and should be applied in the Mutillidae; it is not currently applied in the Pompilidae (Pate, 1946). The name *Tea* Pate, 1946 is currently used for the species previously placed in *Paraferreola*, as a subgenus of *Eoferreola* Arnold. This genus, together with *Arachnotheutes* Haupt and *Stolidia* Priesner, is allied to *Pseudopompilus* Costa, for which a tribal name was proposed by Arnold, 1937, q.v.

Batozonina Haupt, 1950: 49. Type-genus: *Batozonus* Ashmead, 1902 [= *Poecilopompilus* Howard, 1901].

Batozonus is currently placed as a synonym of *Poecilopompilus* Howard (Evans, 1966); the name Episyronina Haupt, 1950, q.v., based on a related currently valid genus, is to be preferred should a supra-generic name be required for the group of genera of which these are part.

Episyronina Haupt, 1950: 56. Type-genus: *Episyron* Schiødte, 1837.

Minageniini Townes, 1957a: 221, 225. Type-genus: *Minagenia* Banks, 1934.

Auplopiini/Auplopiini Haupt, 1959: 17. Incorrect subsequent spellings of Auplopodini Pate, 1946 [1934] q.v. Ferreolini Priesner, 1969 [1929]: 120. Type-genus: *Ferreola* Lepeletier, 1845.

Replacement name for Platyderini Haupt, 1929, q.v.

Psoropempulini Evans, 1975: 263. Type-genus: *Psoropempula* Evans, 1975.

Genus *POMPILUS* Fabricius

Pompilus Fabricius, 1798: 212. Type-species: *Pompilus pulcher* Fabricius, 1798 [= *Sphex cinerea* Fabricius, 1775: 350], by subsequent designation (ICZN Opinion 166, 1945).

Chionopompilus Priesner, 1955: 15, 164. Type-species: *Chionopompilus rabinovitshi* Priesner, 1955 [= *Pompilus niveus* Saunders, 1901], by original designation. **Syn. n.**

♀♂. Length 3–24 mm. Ground colour black, with more or less white/grey/grey-blue pubescence, otherwise black/dark brown pubescent. Wings hyaline, slightly fusco-hyaline or flavo-hyaline with infusate tips. Tibial spurs brown with grey pubescence, stramineous, or white; appendages occasionally with a pinkish ground colour. Female head with eyes sub-parallel or converging above, in males sometimes wider above than below. Malar space sometimes developed, clypeus transverse, truncate or emarginate, labrum entire with weak median emargination, more or less exposed, sometimes reflexed downwards from clypeal margin. Mandible arcuate, elongate, thin, yellow or light brown, darker apically, with a single internal tooth remote from well-developed pointed tip. Female antennae normal, male often thicker distally. Pronotal hind margin angulate. Postnotum transverse, less than length of metanotum, often narrowest in midline. Propodeum convexly rounded, sometimes with a little flattening of the declivity, often with a dorsal median sulcus; declivity never markedly concave or with lateral backward directed teeth. Wings with three SMCs, third narrower than second. Female foretarsus with well-developed tarsal comb-spines, male often with some similar development. Female terminal tarsal segments with a single central longitudinal row of many very fine spines beneath, much smaller and more numerous than those of preceding segment, sometimes lost posteriorly; male lacks spines beneath. Female claws dentate or toothless. Male terminal foretarsal segment normally symmetrical, but fore claws symmetric or asymmetric (inner strongly cleft, outer semi-bifid); other claws dentate or semi-bifid. Female sixth tergum with dorsal surface most frequently covered in hairs modified as globular or leaf-like black or brown adpressed backwardly directed scales, often totally obscuring surface beneath; occasionally only little more developed than conventional pubescence. Male SGP (Fig. 31) with pair of antero-lateral, posteriorly directed lobes or hair-tufts; surface centrally elevated, opaque; laterally flat, transparent: with some posteriorly directed hairs centrally, and some short stout spinous hairs terminally. Genitalia, see Fig. 30.

Pompilus is here restricted to a group of seven species, and is readily recognized as a member of the Pompilini by the criteria of all recent authors. Within the tribe females may be told by the combination of a unidentate mandible, rounded propodeum, general distribution of cinereous pubescence, sixth tergum with modified pubescence, and fifth tarsal segments with minute spines beneath. The cinereous pubescence and rounded propodeum with transverse postnotum will serve to identify males. Because of their small size and agility, males are collected relatively less frequently than the females in relation to their abundance in nature.

DISTRIBUTION. Widespread in sandy habitats throughout the Old World, with a concentration of species in Africa.

BIOLOGY. Species so far recorded are fossorial, stocking short burrows in sand with single spiders of various families.

AFFINITIES. It is clear from the nomenclatural history that *Pompilus* has been used as a blanket genus containing widely different forms. Fixation of a type-species by the ICZN had in part as its objective the assurance of continued usage of the name for a large and important genus of Pompilidae. However, the type-species selected has in fact few closely related species. As early as 1942, Wilcke restricted its use to a single species in Holland, placing all the other Dutch species once considered part of *Psammochares* by Haupt (1927) in other genera. Evans (1951) considered six other groups of species as subgenera, together with a nominate subgenus equivalent to *Pompilus* sensu Wilcke; subsequently, he added a seventh subgenus (1953a). Four of these, *Xenopompilus* Evans, *Perrissopompilus* Evans, *Xerochares* Evans and *Hesperopompilus* Evans, are comparatively rare Nearctic forms, largely characteristic of arid regions and of rather uncertain

affinities. The remaining three, *Arachnospila* Kincaid, *Anoplochares* Banks and *Ammosphex* Wilcke are predominantly temperate Holarctic groups although *Arachnospila*-like forms are found in the Neotropics and *Ammosphex* penetrates to the Kenyan Highlands. *Pompilus* s. str. is widely distributed throughout the Old World, both temperate and tropical. Evans was followed for some time, until Priesner (1968) began to use *Arachnospila* as a genus containing the European subgenera recognized by Evans, save *Pompilus* s.str. which was used as previously by Wilcke. The species of *Arachnospila*, *Anoplochares* and *Ammosphex* form a fairly discrete natural assemblage, with some other Palaearctic forms such as *Pamirospila* Wolf and *Melanospila* Wolf. In particular, they have a black ground colour with black or red anterior abdominal terga, whereas *Pompilus* is normally of black ground colour with more or less grey or grey-blue pubescence. The pubescence of *Arachnospila*-group species is normally dark brown, black or reddish and does not contrast with the ground colour. Many other groups of Pompilidae, however, share a *Pompilus*-like general colour pattern. Although superficially a most unlikely group-character, it correlates quite well with other features of a more fundamental nature, which are considered below.

Evans (1951: 209, 276, 326) drew attention to a possible relationship between *Aporinellus* Banks and *Pompilus* (including *Hesperopompilus*). He cited in particular the common possession of peculiar and striking hair-tufts on the male sub-genital plate shared by these genera. I incline to the view that this is a meaningful similarity, not a parallelism, since further groups exist in which intermediate states of other, divergent, characters may be found. In particular, some members of the Old World genus *Dicyrtomellus* Gussakowski are annectant with species of *Aporinellus*; males of these species have the peculiar hair-tufts on the SGP. *Dicyrtomellus*, as presently defined, is quite a large genus in the Old World, with many rare, undescribed or poorly-known species. They are notably of semi-arid and desert regions, and much further collecting in difficult localities will be necessary in order to elucidate their relationships. *Aporinellus* and *Dicyrtomellus* are predominantly of *Pompilus*-like colour pattern. Arnold (1937: 14) suggested a close affinity between *Aporinellus* (as *Pompiloides*) and *Dicyrtomellus*; however, he had failed to recognize the males of relevant species, and reserved judgement on this basis. He tended to give excessive weight to differences in propodeal structure. *Aporinellus* have the propodeum laterally produced rearwards to form a pair of distinct teeth between which the propodeum slopes continuously forwards to touch the metanotum, obliterating the postnotum. *Dicyrtomellus* have the declivity of the propodeum flattened or slightly concave and the postnotum developed. However, species such as *A. sexmaculatus* Spinola, 1806 have the postnotum visible. '*Pompiloides*' *validus* Arnold, 1936b, and *Pompilus pruinosus* Smith, 1855, are two rare Ethiopian species in which an intermediate condition is discernible. The male of *P. pruinosus* Smith is unknown, whilst '*P.*' *validus* Arnold has the male hair-tufts plainly developed. *Bambesa* Arnold is another (monobasic) genus which can be assigned to the *Aporinellus/Dicyrtomellus* group. *Guichardia* Arnold, another monobasic genus, is a synonym of *Bambesa* (see p. 36). *Aporinellus* s.l. (including *Ferreoloides* Haupt and *Ceratopompilus* Bradley) is widespread throughout the world save Australia. *Dicyrtomellus* is found in the Old World save Indonesia and Australia. *Hesperopompilus* Evans (placed by Evans as a subgenus of *Pompilus*) consists of a few rare and quite diverse elements located in south-western United States and northern Mexico. Were the type-species, *H. orophilus* Evans, encountered in the Palaearctic region, it would be assigned without hesitation to *Dicyrtomellus* by most authors. Some of the other species, however, would not unhesitatingly be so placed. Nevertheless, *Hesperopompilus* is of great interest as a *Dicyrtomellus*-like element in a region of North America which is noted for primitive faunal components which have their nearest relatives in the Middle East region of the Old World, for example *Fedtschenkia* in the Sapygidae, *Crioscolia* in the Scoliidae.

Aporinellus might be regarded as a widespread and diverse group derived from a *Dicyrtomellus*-like ancestor. Similar forms must have given rise to the highly modified oriental group of species allied to *Pompilus ilus* Bingham, which currently has no available generic name. This group of species has lost the tarsal comb and has highly modified, reduced mandibles, probably correlated with an abandonment of the fossorial habit. It is confined to the Oriental and Indonesian forest regions. It is noteworthy that despite a marked modification of the male subgenital plate, the hair-tufts remain well developed. The SGP is of a lanceolate form paralleled in some *Aporinellus* and

Dicyrtomellus.

European authors have used a subgeneric name in *Aporinellus* for the small group of Palaearctic, Oriental and Ethiopian species allied to *Pompilus hasdrubal* Kohl. So far as I have been able to determine, the name is not yet validly proposed under the *International Code of zoological Nomenclature*, since no type-species has been designated; the late H. Priesner, initiator of the name (see p. 36), included multiple species at the time of proposal (1969:84). Thus, *Amblyellus*, type-species *P. hasdrubal* Kohl by present designation, must take present date and authorship (see p. 36). *Amblyellus* has been used more recently as a genus rather than as a subgenus of *Aporinellus*. This usage emphasizes the unique form of the propodeum, which is posteriorly rounded with a barely discernible flattening of the declivity and a specialization of the postnotum, which is strongly developed centrally but becomes obsolete laterally.

Agenioidevagetes Wolf, 1978, was described for two North African species including *Anospilus compactus* Priesner. Their affinities are uncertain. However, the females are strongly *Dicyrtomellus*-like save the possession only of a single preapical tooth on the mandible, and are in this feature and general habitus quite similar to *P. mirandus*, most generalized of the species of *Pompilus* s. str. However, the propodeum is modified much as in some species of *Dicyrtomellus*. The males are of habitus very different from *Pompilus* s. str., *Dicyrtomellus*-like saving the absence of hair-tufts on the SGP.

Ctenostegus Haupt (including *Aglochares* Banks) is a large and diverse genus of Australasian *Dicyrtomellus*-like forms. Evans (1975) has revised the species of this group, which embraces a wide range of disparate morphologies, but with several strong characters in common indicating a monophyletic lineage. In any other part of the world, several generic names would be employed to treat so disparate an assemblage. It seems that when well known, the Australian Pompilidae of many groups contain annectant forms within them which bridge gaps between diverse but related species, giving rise to particular difficulty in developing classifications at the generic level. *Ctenostegus* have lost the second cubital cross vein of the forewing, the males have the SGP with hair-tufts. They thus segregate easily from the species of *Turneromyia* Banks, 1941, another large group of Australian species, which possess three SMCs and lack the hair tufts on the male SGP. The type-species, *Anoplius ahrimanes* Turner, has tubercular protuberances developed medio-laterally on the propodeum, a tendency noted in many but not all of the related species. Species of the group have been treated by Evans (1972) as components of *Pompilus* s.l. However, their affinities are unclear, and I am not convinced that this group is so closely related to *Pompilus* as superficially may appear.

The typical head shape of *Pompilus* s.str. accommodates a long, gently curved mandible which bears a single subapical tooth. In *P. cinereus*, this is employed in a modified form of prey carriage. Most fossorial Pompilidae walk backwards dragging the prey across the substrate. *P. cinereus* picks up the spider in the mandibles, holding it clear of the ground, and walks or runs forwards with it. It is not yet known whether the species of *Pompilus* other than *P. cinereus* employ forward prey carriage, but this might logically be expected from their morphological coincidence. Indeed, the mandibular difference with the inferred behavioural difference, is one of the most telling arguments for the maintenance of a discrete small genus *Pompilus* as here treated. Most or all of the fossorial allies might be expected to drag the prey backwards as previously described. The other genera here discussed predominantly have two sub-apical teeth on a broader, more curved mandible.

It is difficult at this stage to decide on the limits of genera and thus to what extent the groups here postulated to be the nearest relatives of *Pompilus* s. str. might be considered discrete genera, or members of a single, highly diversified genus *Pompilus*. I believe it to be more practical to utilize *Pompilus* for a well-defined but restricted group of definite relationship. For the present, the resultant group of genera may be regarded approximately as equivalent to other groups of Pompilini, each centred on a well-known genus, such as *Arachnospila*, *Anoplius*, *Episyron* and *Agenioideus*. It will be convenient to refer to these as genus-groups (Article 42c, *Int. Code zool. Nom.*). Thus, I regard the *Pompilus*-like genera discussed above as members of the *Pompilus* genus-group. This has the advantage of permitting a defined classification on a tentative basis, allowing scope for subsequent modification without nomenclatural complications.

In addition to the form of the male SGP, these genera are united (save some isolated species of

South African *Dicyrtomellus*) by the generally dark ground coloration and the tendency to development of grey or blue-grey pubescence.

The residual subgenera of *Pompilus* sensu Evans are rather discrete elements. *Perissopompilus* and *Xenopompilus* might best currently be placed as genera which have affinities with the *Agenioideus* genus-group. *Xerochaeres* may have affinities with Neotropical Pompilini; I have recently seen material from Columbia, a significant extension to the known range, southern U.S.A. and Mexico. *Hesperopompilus*, despite its diversity, should be included in the *Pompilus* genus-group. *Arachnospila*, *Anoplochaeres* and *Ammosphex* are central to the *Arachnospila* genus-group.

Key to species of *Pompilus*

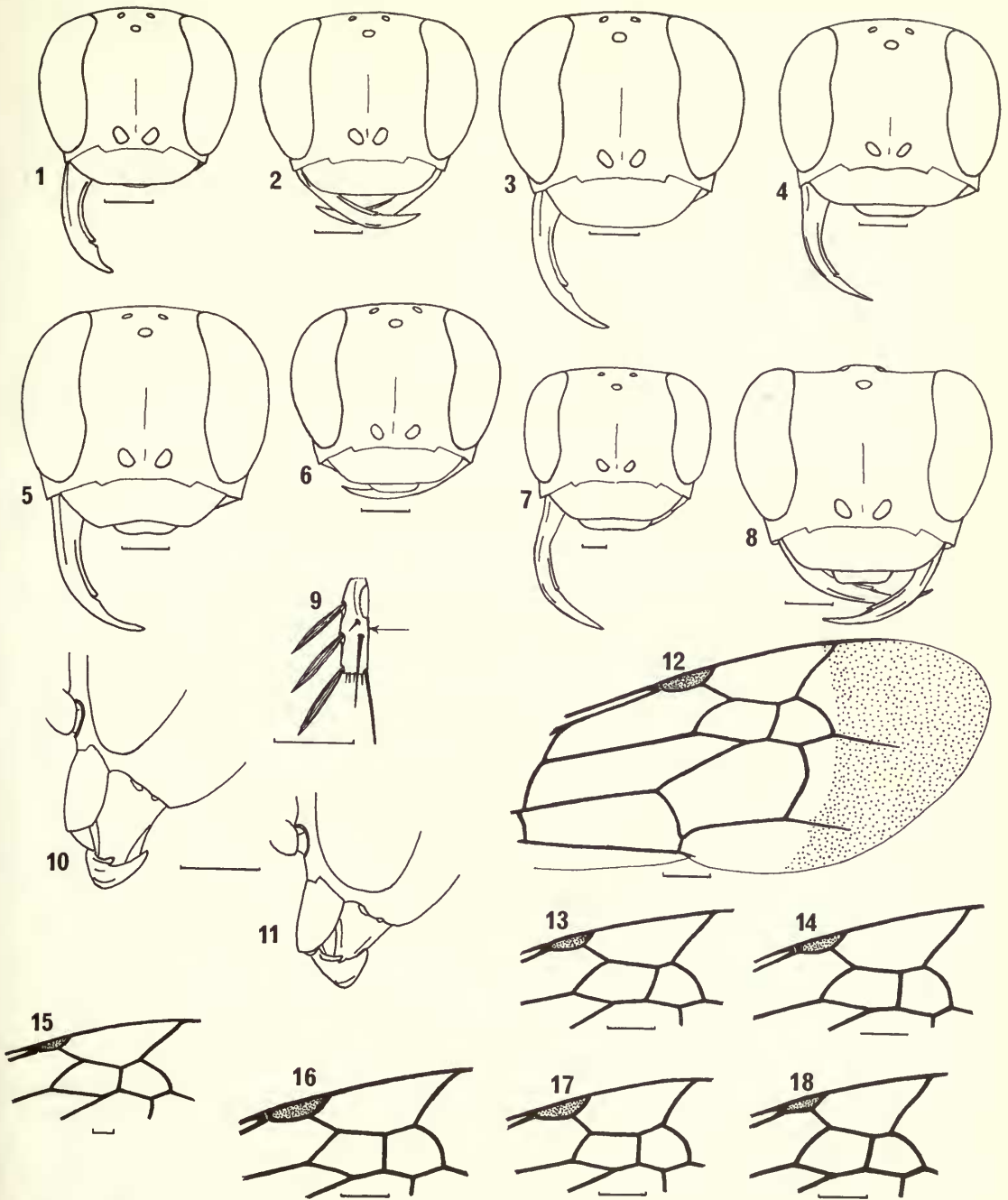
Females

- 1 Palaearctic (excluding North Africa), Oriental, Indonesian and Australian regions 2
- Continental Africa and Madagascar 3
- 2 'Pygidial area' of sixth tergum with pubescence strongly modified (compare with pubescence of fifth tergum) as short, stout scales that uniformly cover and obscure upper surface of tergum; tibial calcaria white or dark; SMC 2 and SMC 3 as in Fig. 12; 2nd cubital cross-vein oblique; face as in Fig. 2; throughout the Old World *cinereus* (F.) (p. 12)
- 'Pygidial area' of sixth tergum with pubescence not or little modified as short, stout scales; tibial calcaria dark; SMC 2 and SMC 3 as in Fig. 14; 2nd cubital cross vein perpendicular; face as in Fig. 1. Oriental, Indonesian regions *mirandus* (Saussure) (p. 26)
- 3 Tarsal comb of three blade-like superior comb-spines, and at least five well-developed inferior comb-spines.
 - Almost uniformly whitish grey pubescent, with many long, erect white hairs save on dorsum of abdomen. Wings often yellowish hyaline, sometimes hyaline. Sahara desert *niveus* Saunders (p. 35)
 - Tarsal comb of three superior comb-spines, not more than two well-developed inferior comb-spines 4
 - 4 Wings markedly yellow with infusate tips; extensively grey pubescent, save 4th, 5th, 6th terga wholly black. Large species (14–24 mm). Central and southern Africa *irpex* Gerstaecker (p. 33)
 - Wings rarely faintly yellow, usually hyaline or slightly fusco-hyaline with infusate tips; when extensively grey-pubescent, 4th and 5th terga similar to terga 1 to 3, 6th black 5
 - 5 Clypeus short and broad (4.0 times broad as high), labrum clearly visible; face as in Fig. 4; scales on 'pygidial area' strongly developed, distributed also on upper lateral surface of tergum; body save 6th tergum almost entirely whitish grey-pubescent, calcaria white; intercubital vein between SMC 2, SMC 3 perpendicular; SMC 3 higher than SMC 2 (Fig. 17); terminal tarsal segments lack a clearly visible row of minute spines beneath; sometimes with a tinge of yellow in forewing. Central and southern Africa, Madagascar *cadmius* Saussure (p. 29)
 - Clypeus less broad, labrum not always visible; scales on 'pygidial area' not overlapped onto lateral surface of tergum; body grey-pubescent, normally with some dark pubescence, at least anteriorly on terga 2 and 3; calcaria white, grey-pubescent or most frequently brown; intercubital vein and SMCs otherwise; terminal tarsal segments with row of minute spines beneath; wings hyaline or fusco-hyaline 6
 - 6 Clypeal margin transverse, labrum exerted but reflexed inwards approximately at a right angle to the clypeus (Fig. 10); face as in Figs 5, 6; SMCs as in Fig. 18. Central and southern Africa 7
 - Clypeal margin convexly rounded or transverse, labrum not reflexed (Fig. 11); face as in Fig. 3; SMCs as in Fig. 13. Widely distributed in Africa and Madagascar *cinereus* (F.) (p. 12)
 - 7-'Pygidial area' of tergum six with hairs thickened but not scale-like; face as in Fig. 6; extensively marked with black; fore basitarsus with a row of three superior comb-spines, a row of two inferior comb-spines, and one short spine ventrally between the rows (Fig. 9). Kalahari desert *botswana* sp. n. (p. 33)
 - 'Pygidial area' of tergum six with thick, scale-like hairs; face as in Fig. 5; extensively marked with grey; fore basitarsus with three superior and two inferior comb-spines. Central and southern Africa *bilineatus* (Arnold) (p. 31)

Males

The male of *P. botswana* is not yet known.

- 1 Palaearctic (excluding North Africa), Oriental, Indonesian and Australian regions 2
- Continental Africa and Madagascar 3
- 2 Face relatively broad between the eyes (Fig. 20), vertex not distinctly raised or rounded in facial view, though ocelli often demarcate a raised central platform; SMCs as in Fig. 12; terminal



Figs 1–18 *Pompilus* species, females. 1–8, head in frontal view of (1) *P. mirandus*; (2) *P. cinereus* (Oriental); (3) *P. cinereus* (Ethiopian); (4) *P. cadmius*; (5) *P. bilineatus*; (6) *P. botswana*; (7) *P. irpex*; (8) *P. niveus*. 9, left foremetatarsus, posterior view, *P. botswana*. 10, 11, labrum in lateral view of (10) *P. bilineatus*; (11) *P. cinereus*. 12, right forewing, *P. cinereus* (Oriental). 13–18, SMCs of (13) *P. cinereus* (Ethiopian); (14) *P. mirandus*; (15) *P. irpex*; (16) *P. niveus*; (17) *P. cadmius*; (18) *P. bilineatus*. Scale lines: 0.5 mm.

- comb-spines of fore basitarsus clearly more than half as long as second tarsal segment. Throughout the Old World **cinereus** (F.) (p. 12)
- Face less broad between eyes (Fig. 19); vertex distinctly raised, rounded in facial view; SMCs as in Fig. 14; terminal comb-spines of fore basitarsus not more than half as long as second tarsal segment. Oriental, Indonesian regions **mirandus** (Saussure) (p. 26)
- 3 Fore basitarsus with comb of three strong spines, yellow distally, and with two long inferior comb-spines; body with dense, decumbent grey-white pubescence. Sahara desert **niveus** Saunders (p. 35)
- Fore basitarsus usually with comb of two or three black spines, but never more than one long inferior comb-spine; body usually not entirely grey-pubescent 4
- 4 Clypeus short, broad, with concave margin and exerted labrum; malar space well developed (Figs 23, 24) claws of foretarsus specialized, asymmetric, of other tarsi semibifid (Fig. 26); pterostigma not or little thicker than costa plus subcosta 5
- Clypeus less broad, more or less transverse, labrum not or little exerted; malar space less well developed (Figs 21, 22); fore claws not specialized, symmetrical, others dentate or toothless (Fig. 25); pterostigma much thicker than costa plus subcosta 6
- 5 Wings yellow with infusate tips; face as in Fig. 24; 1st flagellar segment 3.0 times as long as thick. Central and southern Africa **irpex** Gerstaecker (p. 33)
- Wings hyaline with infusate tips; face as in Fig. 23; 1st flagellar segment less than 3.0 times as long as thick (Fig. 27). Central and southern Africa **bilineatus** (Arnold) (p. 31)
- 6 Antennae viewed ventrally more or less strongly thickened distally (Fig. 29); SMC 2 and SMC 3 with perpendicular intercubital vein; stigma as in Fig. 17; propodeum with distinct median longitudinal groove distally; white pubescent. Central and southern Africa, Madagascar **cadmius** Saussure (p. 29)
- Antennae viewed ventrally not or only slightly thickened distally (Fig. 28); SMC 2 and SMC 3 with oblique intercubital vein; stigma as in Fig. 13; propodeum with a dorsal median line only; grey-pubescent. Widely distributed in Africa and Madagascar **cinereus** (F.) (p. 12)

***Pompilus cinereus* (Fabricius)**

(Figs 2, 3, 11–13, 20, 21, 25, 28, 30–38)

Sphex cinerea Fabricius, 1775: 350. Holotype ♀, AUSTRALIA (BMNH) [examined].

Sphex plumbea Fabricius, 1787: 278. Holotype ♀, SPAIN (UZM) [examined]. [Synonymy by Evans, 1972: 11.]

Pompilus cinereus (Fabricius) Fabricius, 1798: 250.

Pompilus pulcher Fabricius, 1798: 249. Holotype ♀, ITALY (MNHN) [not located, presumed lost]. [Synonymy by Evans, 1972: 11.]

Pompilus pulcher Fabricius; Coquebert, 1801: pl. 12, Figs 8A, B. [Good figures, believed to be of lost primary type-specimen of *P. pulcher*.]

Pepsis plumbea (Fabricius) Fabricius, 1804: 215.

Ferreola plumbea (Fabricius) Saussure, 1867: 47; ♀.

Pompilus pruinus Smith, 1879: 147. Holotype ♀, INDIA (BMNH) [examined]. [Junior primary homonym of *Pompilus pruinus* Smith, 1855. Synonymy with *P. plumbeus* by Arnold, 1937: 47.] **Syn. n.**

Pompilus chevrieri Tournier, 1889: 169. Lectotype ♀, SWITZERLAND? (MHN), designated by de Beaumont, 1946: 164 [examined]. **Syn. n.**

Pompilus cinereus (Fabricius); Dalla Torre, 1897: 280.

Pompilus leprosus Dalla Torre, 1897: 298. [Replacement name for *Pompilus pruinus* Smith, 1879.] **Syn. n.**

Pompilus plumbeicolor Dalla Torre, 1897: 311. Holotype ♀, SOUTH AFRICA (NMW) [examined]. [Proposed for *Ferreola plumbea* (Fabricius) Saussure, 1867, thought to have been a misidentification.] **Syn. n.**

Pompilus plumbeus (Fabricius); Dalla Torre, 1897: 311.

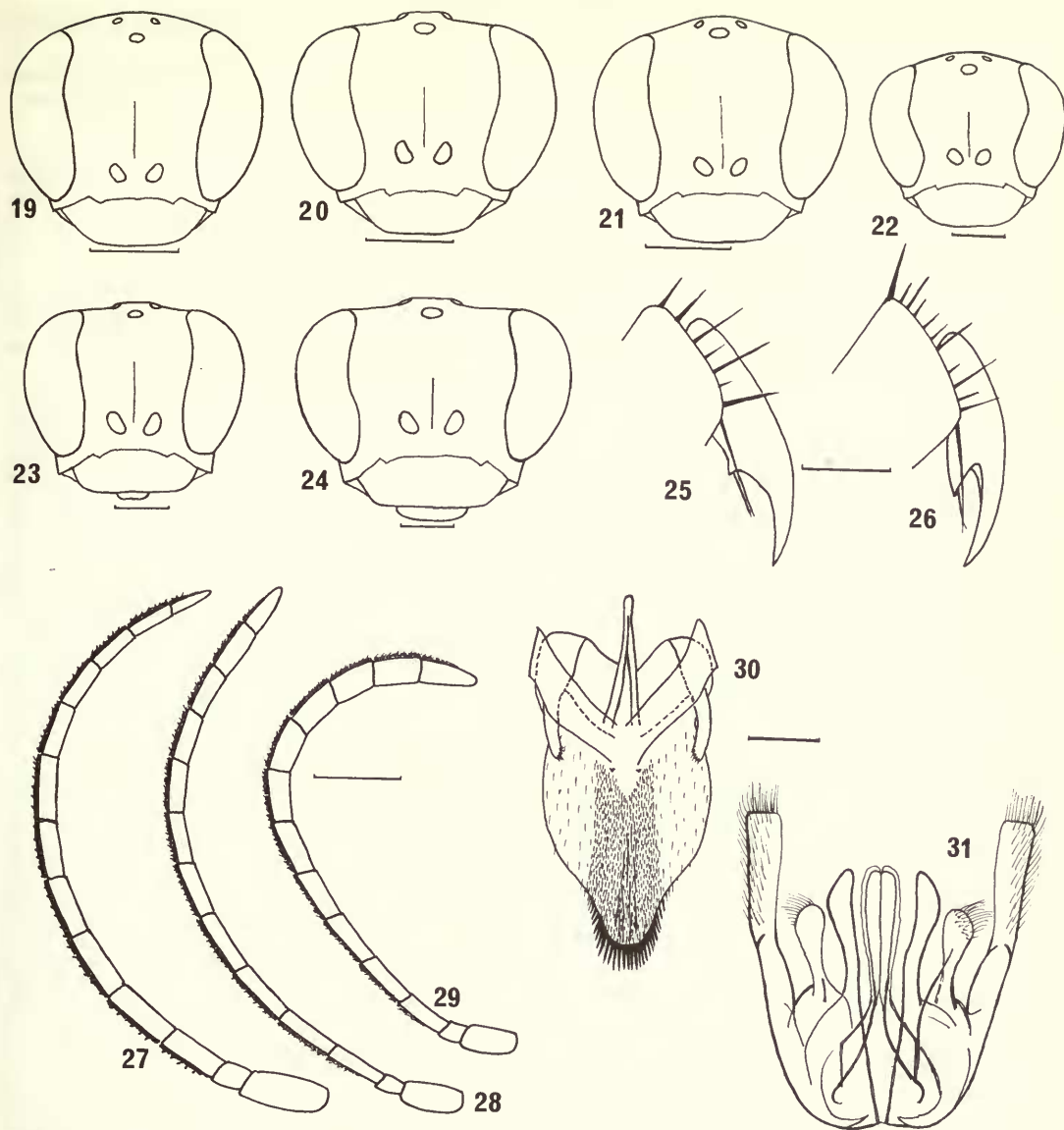
Pompilus ithonus Cameron, 1908: 301. LECTOTYPE ♀, INDIA (BMNH), here designated [examined]. **Syn. n.**

Pompilus sericeibalteatus Cameron, 1910: 250. Holotype ♂, TANZANIA (NR) [examined]. [Synonymy with *P. plumbeus* by Arnold, 1937: 47.] **Syn. n.**

Psammochares plumbeus (Fabricius) Šusterka, 1912: 210. [Invalid subsequent designation of type-species for *Psammochares* Latreille, 1796.]

Psammochares (Psammochares) plumbeus (Fabricius); Haupt, 1927: 179. [As type-species of *Psammochares*, after Šusterka, 1912.]

Psammochares (Psammochares) plumbeus forma *pulchra* (Fabricius); Haupt, 1927: 181.



Figs 19–31 *Pompilus* species, males. 19–24, head in frontal view of (19) *P. mirandus*; (20) *P. cinereus* (Oriental); (21) *P. cinereus* (Ethiopian); (22) *P. cadmius*; (23) *P. bilineatus*; (24) *P. irpex*. 25, 26, midtarsal claws of (25) *P. cinereus*; (26) *P. bilineatus*. 27–29, antenna of (27) *P. bilineatus*; (28) *P. cinereus*; (29) *P. cadmius*. 30, 31, *P. cinereus* (NW. Europe), (30) SGP; (31) genitalia. Scale lines 19–24, 27–29: 0.5 mm; 25, 26: 0.1 mm; 30, 31: 0.25 mm.

Sericopompilus bivittatus Banks, 1934: 97. LECTOTYPE♀, PHILIPPINES (USNM), here designated [examined]. **Syn. n.**

Psammochares (*Psammochares*) *plumbeus* f. *maroccana* Nadig & Nadig, 1935: 10. [Nomen nudum.]

Psammochares plumbeus (Fabricius); Arnold, 1937: 47. [As type-species of *Psammochares*; Ethiopian fauna.]

[*Psammochares latilabris* Arnold, 1937: 47; ♂. Missassociation of sexes. Misidentification.]

[*Psammochares bilineatus* Arnold, 1937: 50; all ♀ of type-series, save holotype. Misidentification.]

Aporoideus clarus Banks, 1941: 359. Holotype ♀, MADAGASCAR (ANS) [examined]. **Syn. n.**

Pompilus plumbeus (Fabricius); Wilcke, 1942: 25.

Pompilus pulcher Fabricius; Wilcke, 1942: 25. [Invalid subsequent designation of type-species for *Pompilus* Fabricius, 1798, in anticipation of Opinion 166.]

Pompilus pulcher Fabricius; International Commission on Zoological Nomenclature, Opinion 166, 1945: 377. [*P. pulcher* validated as type-species of *Pompilus* Fabricius, 1798; all previous designations set aside.]

Pompilus plumbeus (Fabricius); Evans, 1951: 208.

[*Pompilus pulcher* f. *placidus* Priesner, 1968: 176. Unavailable name, proposed expressly for a form.]

Pompilus plumbeus lusitanicus Wolf & Diniz, 1970: 23. Holotype ♀, PORTUGAL (NMW, not 'Narodni Museum, Prag' as originally stated) [examined]. **Syn. n.**

Pompilus cinereus (Fabricius); Evans, 1972: 11.

Pompilus plumbeus gotlandicus Wolf, 1972a: 83. Holotype ♀, SWEDEN (NR) [examined]. **Syn. n.**

Pompilus plumbeus chevrieri Tournier; Wolf, 1972a: 84.

P. ithonus Cameron. Cameron described female and male; a specimen of each sex in BMNH bears labels 'Pompilus ithonus Cam. type Deesa'. The female is *P. cinereus*, the male *P. mirandus*. I have labelled and here designate as lectotype the female specimen.

S. bivittatus Banks. Banks described only the female, and listed two localities. A female from Iligan, Mindanao in the USNM bears a label in Banks's handwriting, 'Sericopompilus bivittatus Type' and a red USNM type label, no. 51230. A second female, from Cuernos Mts, Negros, bears a USNM paratype label no. 51230. A third female, from Cuernos Mts, in MCZ, bears Banks's paratype label and MCZ label 'Type 17108'. There is also an unlabelled male in USNM. I have labelled, and here designate as lectotype, the female from Iligan, which bears Banks's type label.

P. plumbeicolor Dalla Torre. A single specimen in Vienna can be identified as Saussure's *Ferreola plumbea*; I have labelled it holotype of Dalla Torre's *P. plumbeicolor*.

Haupt (1929: 193) placed *P. cadmius* Saussure in the synonymy of *P. plumbeus*. However, it is here accorded status as a distinct species (p. 29). He also referred to an undescribed species from 'Nyassa-See' which is in all probability either *P. cadmius* or *P. bilineatus*. He also placed *Salius* (*Schistosalius*) *atritylus* Saussure, 1892, in the synonymy of *P. plumbeus*. I have not yet been able to locate type-material and cannot place the species on the basis of the figure. However, it is not a *Pompilus*.

Arnold (1937) placed three further names in the synonymy of *P. plumbeus*; Evans (1972) referred to these as possible synonyms of *P. cinereus*. Two of these (*P. pruinosus* Smith, 1879 and *P. sericeibalteatus* Cam.) are here so confirmed. The third, *Pompilus subsericeus* Saussure, is not so; the holotype specimen agrees well with the figure; it is a species of *Anoplius* s. str. (see p. 36). Saussure's description mentions the characteristic spinous setae on the sixth tergum and it is difficult to see how Arnold might have misidentified the species. Evans (1972) quotes Arnold as listing 'China' amongst the localities for *P. plumbeus* (= *cinereus*). This information was doubtless based on the type-locality (Shanghai) given for *P. subsericeus* Saussure. Whilst I have no doubt that *P. cinereus* will be found to be widespread in China, the record is based on a misdetermination. I have seen one Chinese specimen.

♀. Length 5–14 mm. Black, occasionally tending to pinkish red on limbs and tegulae; pubescence grades from uniformly brown-black, through limited amounts of blue-grey to development of an almost entire covering of thick whitish grey pubescence. Wings hyaline or fusco-hyaline, forewing with infuscate outer margin. Calcaria white, stramineous, brown or grey. Temples, prothorax and fore coxae with long, erect white hairs, sterna with few erect dark hairs.

Face broad below, narrowed above, extremely variable (Figs 2, 3) clypeus rarely exceeds 3.2 times as broad as high, margin more or less transverse or convex, labrum almost concealed, not reflexed downwards, slightly indented centrally. Pronotal hind margin angulate, sometimes only weakly so. Postnotum narrowest in centre, but transverse. Propodeum rounded and narrow behind, with a more or less well-developed dorsal longitudinal impressed line. SMC 2 usually much longer than SMC 3 on radial vein, 2nd intercubital cross vein normally sloping, stigma as in Figs 12, 13; sixth tergum with hairs strongly modified as distinct globular leaf-like scales, dark or light in colour, obscuring most of tergum. Fore metatarsus with three comb-spines and two inferior comb-spines, variable in length and thickness. Terminal tarsal segments with row of minute spines beneath; claws dentate or toothless.

♂. Length 4.0–7.5 mm. Black; extensively grey-pubescent, always notably more so than females of similar provenance. Temples with erect white hair.

Head shape variable (Figs 20, 21). Distal antennal segments somewhat thicker than proximal. Propodeum rounded behind, in some populations more abruptly declivous, with a more or less well-defined median

sulcus. Wing venation as in female, or with SMC 3 tending to triangular. SGP as in Fig. 30, normally with many erect hairs. Tarsal claws dentate, uniform. Fore metatarsus with two or three comb-spines and one inferior comb-spine, of variable length. Terminal comb-spine often at least half length of second tarsal segment.

P. cinereus is the most widespread species of the genus and through much of its range is the sole *Pompilus* species found. In central and southern Africa, Madagascar and the Orient it is sympatric with various congeners from which it may normally be told by the characters given in the keys. Further notes concerning the identity of its congeners are given under the treatments of those species.

DISTRIBUTION. Throughout the continental Old World including Mediterranean islands, Canary Islands, Madagascar, Sri Lanka, Japan, the Philippines, Borneo, Java and Australia; Maps 1 and 2, pp. 28, 32.

VARIATION. *P. cinereus* is a widely distributed and often common species of perplexing variability both within populations and between them. In a sense, it is here recognized as the residue after definition of its congeners, which are morphologically more stable and of more restricted distribution. Although *P. cinereus* is found from the north-west Atlantic coast of Europe to Australia and from southern Japan to Cape Province, South Africa, I have been able to find no satisfactory criteria for splitting the assemblage into component species. Geographic forms can often be discerned on the basis both of their morphology and colour pattern; however, these forms tend to recur in different parts of the distribution, are probably independently locally derived and are rarely clearly defined when sufficient material is to hand. Nevertheless, it may prove possible in the future to recognize component species within the assemblage.

A feature of *P. cinereus* (and also *P. cadmius*) is the exceptionally large size range encountered, particularly of females, within local populations (see also under 'Biology' p. 17). The phenomenon gives rise to distinct allometric morphological variation. This is most usually observed as a tendency to greater thoracic breadth and depth in relation to length in larger specimens. The face tends also to be relatively narrower between the eyes above in larger specimens. This presents problems in so far as the shape of the face also varies on a geographic basis so as to give an immediate impression of specific distinctness if any two individuals of widely separated populations were to be compared. However, the sum of variation observed points towards clinal trends rather than genetic discontinuity and I feel it premature to attempt any division of the whole on this basis.

A further point of interest lies in the effect of sympatry with its congeners. In Central Africa, *P. cinereus* coexists with two other *Pompilus*, *P. irpex* and *P. cadmius*. *P. cinereus* is most ubiquitous and normally most common of the three; however, the other two are not uncommon species and may be locally abundant. A fourth (rarer) species, *P. bilineatus*, may also coexist with the other three, but less commonly so. Within the boundaries of this coexistence (Map 2, p. 32) *P. cinereus* is remarkably uniform morphologically and with a single colour trend which correlates well with climatic temperature ranges. Beyond this area, *P. cinereus* exhibits a morphological and colour spectrum which approximates to an amalgam of separate characters of the coexistent Central African species, conforming to aspects of the character displacement concept described by Brown & Wilson (1956).

P. cinereus coexists with another congener, *P. mirandus*, in the Oriental region. Here, save in north-west India, *P. cinereus* is less frequent, restricted to sandy shores and river banks. *P. mirandus* on the other hand seems well adapted to more vegetated sandy areas of moderate rain fall, and is often a common pompilid in collections from such regions. Again, where the two species coexist, they adhere well to a defined morphology, though each varies geographically. Beyond the sympatric zone *P. cinereus* approximates more closely to a form intermediate with *P. mirandus*; in north-west India, the two are morphologically very similar and segregate best on characters of the venation and colour pattern. Males are particularly difficult.

Within the range of *P. cinereus*, the following broad trends can be discerned. In north-west Europe and the Cape Province of South Africa, females are extensively black or brown-pubescent balanced with rather little grey or blue-grey pubescence. In hot, dry regions, an entire covering of grey pubescence is developed. In southern India, Saudi Arabia, Cyprus, Mallorca, the Canary

Islands and most of the Sahel region of Africa, grey pubescence predominates, with minimal black coloration, mostly anteriorly on the terga, longitudinally at the sides of mesonotum and the centre of the scutellum. In most other regions, grey pubescence is less than in these extremes, perhaps only 50% of the body surface. However, specimens in poor condition lose pubescence and appear darker than locally is normal. As a general rule, males are never less, usually more, grey-pubescent than females from the same locality. The extent of grey or black pubescence probably correlates with exposure to sunlight; darker individuals are by and large characteristic of colder regions, heavily grey individuals of deserts.

North-west European populations have a relatively broad face and SMC 2 and SMC 3 tend to be approximately equal in area; throughout the remainder of the species range SMC 2 is otherwise much greater in area than SMC 3. Females are predominantly black-pubescent dorsally with narrow transverse strips of grey at the rear of each tergum, interrupted medially. The face is dark above, grey below the antennal insertions. Specimens from Gotland, Sweden, are black with dark brown pubescence posteriorly on the abdomen of some specimens, or with a little grey on that of others; these specimens are the basis of the 'subspecies' *P. plumbeus gotlandicus* Wolf. In northern Spain and Portugal, a dark form (almost identical with that found from Sweden and Poland, via the Low Countries, United Kingdom and France) is found, but with the face narrower above. In southern Portugal, individuals that are almost entirely black are found (*P. plumbeus lusitanicus* Wolf & Diniz), sympatric with more normally grey individuals previously regarded as *P. p. plumbeus*. The latter is characteristic of south-east Spain and the Mediterranean region in general, including North Africa and Morocco. It is worth noting here that previous authors have employed the names *P. pulcher* and *P. plumbeus* for different so-called subspecies of *P. cinereus*, the former supposedly substantially more grey-pubescent than the latter. In fact, the type-material (from Italy and southern Spain respectively) are of similar degrees of grey pubescence!

In the Canary Islands, a grey-pubescent form with white calcaria and a triangular SMC 3 is found. Within the Mediterranean, populations on Mallorca and Cyprus are extremely grey-pubescent, the former with white calcaria. That on Crete, however, is like the north-west European form, save with a narrower face. Israeli material is heavily grey-pubescent but with a narrower clypeus and off-white calcaria.

The dominant African and Madagascan form is similar to that in the Mediterranean, with brown or grey calcaria, face slightly narrower above, and grey colour on head and thorax more uniformly and generally distributed. Only an anterior portion of most terga is black. However, from Ethiopia west across the Sahel to Senegal, including the north of Zaire and the West African coast, a more distinctive form occurs of similar morphology but with white calcaria and pinkish extremities beneath white-grey pubescence. This form is also found eastwards to Saudi Arabia, whilst at Aden and Dhofar, a form of Central African morphology but with a slightly broader face is found. In Cape Province, a form of African morphology but again with a slightly broader face, parallels the dark form of the north-west Palaearctic. Males associated with these females have a more abruptly declivous propodeum. It is this form that Arnold misidentified as his *P. bilineatus*. I have seen forms transitional in colour pattern within a population from Ceres, Cape Province. Mapping of the distribution of the normal African and dark Cape forms would be an interesting project for South African hymenopterists, since there may here prove to be a more abrupt transition than others noted within *P. cinereus*. Both dark and heavily grey-pubescent forms occur on Madagascar.

Across the Palaearctic from Turkey to southern Japan, variation in grey pubescence can be noted, but material is scarce and difficult to interpret. A tendency eastwards to a broadening of the face can also be noted. At Karachi, the females are characterized by a more distinctly brown coloration of the wings. Populations from India become more grey-pubescent and broad-faced, with white calcaria, towards Sri Lanka. From north-west India to Java, *P. cinereus* overlaps the range of *P. mirandus*. However, the two species occur together less frequently than do their congeners in Africa. Forms very close in morphology to the Mediterranean form, but with white calcaria and broader face, have been taken in Burma, Singapore and Java, where in each case they are readily differentiable from the more common and widely distributed *P. mirandus*. Populations are also known from the Philippines and Borneo. However, *P. cinereus* is not common in the

Orient, a probable consequence of the rarity in this region of suitable habitats.

A discontinuity, whether of distribution or of collecting is unclear, exists between Java and Australia, whose populations, of various patterns of grey pubescence, are found from Northern Territory to New South Wales and south west Australia. Australian females have the scales of the sixth tergum confined to a narrower central longitudinal strip than do females from elsewhere in the Old World.

Geographic variation in the form of the male SGP is quite marked. The relative length and thickness of the hair-tufts and the degree of expansion of the lateral transparent portion of the SGP are particularly prone to variation. Extreme differences can often be noted between geographically close populations, but these do not correlate with any noteworthy characters of females.

P. cinereus thus has a distribution which is both land-encompassing in dune systems and on sea shores, both of continents and islands, and dendritic inland, pursuing the courses of rivers (both permanent and intermittent). This is uniquely compatible with the kind of all-embracing distribution observed. In particular, the life history is independent of any specific vegetational associations, which for species of other genera may play a decisive part in defining distributions ecologically. For these reasons, coupled with the lack of obvious characters, at least at the level exhibited by its congeners, I treat *P. cinereus* as a single species and thus confirm the view of Evans (1972). Partly for these reasons, I also refuse formally to recognize subspecific entities within the assemblage, and have reduced to synonymy all infraspecific names. However, I also doubt the general value of this traditional approach to taxonomy. I suspect that the system of trinomial nomenclature has served a useful purpose in discouraging the description of spurious species, particularly in popular much-collected groups. However, this historical need should by now be satisfied and we must consider the system *per se*. I see no real need for infraspecific names to be formally recognized within the International Code of zoological Nomenclature, which already positively excludes infra-specific names. The fundamental problem is that of endeavouring to utilize binominal nomenclature for functions beyond its practical scope. Problems arise when available infraspecific names must be considered in competition under rules of priority, and each is representative neither of mutually exclusive nor totally inclusive entities. The kind of situation which Betrem (1972: 12) considers is indicative of the inappropriateness of the method. Essentially, I can add nothing to the excellent review by Wilson & Brown (1953) who elected to eschew infraspecific names in their work with Formicidae.

BIOLOGY. A common species particularly of coastal dunes and sandy river beds and banks. The nest is a simple burrow in the sand. The species is noteworthy for forward prey carriage and temporary burial of the prey during nest excavation. Spiders of the families Lycosidae, Gnaphosidae, Zoridae, Clubionidae, Pisauridae and Thomisidae have been recorded from the north-west Palaearctic as prey of *P. cinereus*; see Richards & Hamm (1939), Grandi (1961). Evans & Matthews (1973) record spiders of the genera *Arctosa* and *Pisaura* as prey in Australia. Further records here presented are previously unpublished and include the family Salticidae for the first time; material is in BMNH.

Greece: Iliia, mouth of R. Alfios, 10.vii.1979, *Neatha* sp. (Salticidae) (*M. C. Day*). **Morocco:** Agadir, coastal dunes, 16.v.1975, *Xerolycosa* or *Lycosa* sp. (Lycosidae) (*G. R. Else*). **Tanzania:** Tanga, 19.ix.1917, 2 ♀ each carrying *Lycosa* sp. (Lycosidae) (*W. A. Lambourn*). **Angola:** R. Curoca, 7 m [11 km] NE. of Porto Alexandre, 25.ii.1972, Gnaphosidae (*M. C. Day*). **Botswana:** Lake Ngami, 12 m [20 km] NE. of Sehitwa, 17.iv.1972, *Phlegma* sp. ♂ (Salticidae); Pardosinae (Lycosidae) (*M. C. Day*). **South Africa:** Port Elizabeth, dunes, 27.iii.1953, ?*Lycosa* sp. (Lycosidae); 25.iv.1953, the same (*E. McC. Callan*).

More than two dozen contributions in various languages document observations on the biology of *P. cinereus* (mostly recorded as *P. plumbeus* or *P. pulcher*). Unfortunately, some early authors misconstrued the fragments of behaviour observed. Richards & Hamm (1939), in a summary of the biology of *P. cinereus* (as *plumbeus*) culled largely from the literature but augmented by observation, reported that *P. cinereus* excavates its cells before hunting the prey. In so doing, they accepted in particular the observations of Adlerz (1906). In fact, as previously reported by Stelfox (1927) and subsequently by Mócsár (1943), Crèvecoeur (1945), Bristowe (1948) and Evans & Matthews (1973), the nest is only excavated once the prey has been located and paralyzed.

Unfortunately, Evans (1953*b*; 1958) utilized the incorrect observations in papers synthesizing a schema of behavioural relationships in the Pompilidae. He thus placed '*P. plumbeus*' in a position of unwarranted behavioural evolutionary advancement. This misinformation has unhappily been incorporated in various text books. However, following personal observation of Australian populations, Evans & Matthews (1973) gave information which correlates well with other accounts in which the correct facts were elucidated, which are that the prey is temporarily buried before a burrow is commenced elsewhere. In view of the published dichotomy of opinion, I give further observations of my own. They confirm that *P. cinereus* is behaviourally quite versatile, some apparent inconsistencies between previous reports are thus resolved. I have been able to make original observations with regard to the fate and behaviour of the prey and the development of the larva of *P. cinereus*.

P. cinereus is a common and dominant pompilid in habitats of which the soil is more or less pure sand, often with some proximity to water. In coastal dunes and in sandy river beds and banks throughout the Old World, *P. cinereus* can develop dense populations such that locally it may be the commonest readily observed insect. It exists at much lower densities in more vegetated sandy situations or those which lack the obvious association with water. I have observed it in southern Africa, Greece and South Wales.

In tropical and Mediterranean climates, *P. cinereus* is active notably early in the day. I encountered it at 07.30 at Okahandja, Namibia, considerably earlier than species of other genera would normally be encountered. Similarly, the species was found active as late as 19.30 near Porto Alexandre, Angola. Unless the day was very hot, the species was often found throughout the midday period. Thus, the time available daily for hunting and provisioning was long by comparison with species of other genera. Even in South Wales, *P. cinereus* seems to be active in marginal conditions, when for example *Anoplius infuscatus* or *Arachnospila trivialis* may have ceased activity.

Males of *P. cinereus* are normally to be found flying low over sand in areas where females may be encountered. They are usually small and difficult to net and are thus relatively less frequent in collections than are females. Night and bad weather are passed just below the surface of the sand.

I collected almost three hundred *P. cinereus* in southern Africa (see material examined) but attempted to make biological observations only in Botswana, near Lake Ngami on 17 April, 1972 on the banks of a river south-west of Toteng. *P. cinereus* was very abundant on the gently sloping banks but was not found on the flood plain at any distance from the water. I encountered a female at 10.30 drinking at the waterside, which then flew rapidly to a cattle hoofprint, where she searched for and retrieved a paralysed spider (Pardosinae) of size similar to herself. She picked up the prey in her mandibles, and flew and ran forwards with it for 15 m. Shortly, the top of the slope was reached, and the wasp temporarily buried her prey in a shallow depression, excavated for the purpose in the shade of a leaf of a creeping plant. She then began agitatedly to search hither and thither, until I lost track of her in the general mêlée of active *P. cinereus* individuals. I thus returned to watch the buried prey. After four minutes, a female wasp of identical size approached the prey directly, disinterred it, and set off again. I lost my nerve, and captured it.

At 12.00 I encountered a female searching by a Malaise trap on soft sand at plain level. She unearthed a temporarily buried prey individual (*Phlegma* sp. ♂). She did not sting it, but ran and flew forwards with it for 5 m, when she effected temporary burial against a lump of compacted sand (the area was much trampled by cattle). She then flew off and searched about for some time until I lost track of her. I waited by the prey, which was revisited twice; on each occasion further sand was kicked over it. After about 15 minutes she disinterred the spider and flew and ran with it directly to a burrow situated at the bottom of a small depression. She ran straight in forwards carrying the spider. Five minutes later the wasp re-emerged and flew off a short distance. I captured the female and excavated the burrow, which was difficult to trace in dry sand. The spider was found at a depth of 8 cm, but bore no egg. Although adding no new knowledge, these observations coincide very closely with those made by Evans & Matthews in Australia, as well as NW. Palaearctic observations.

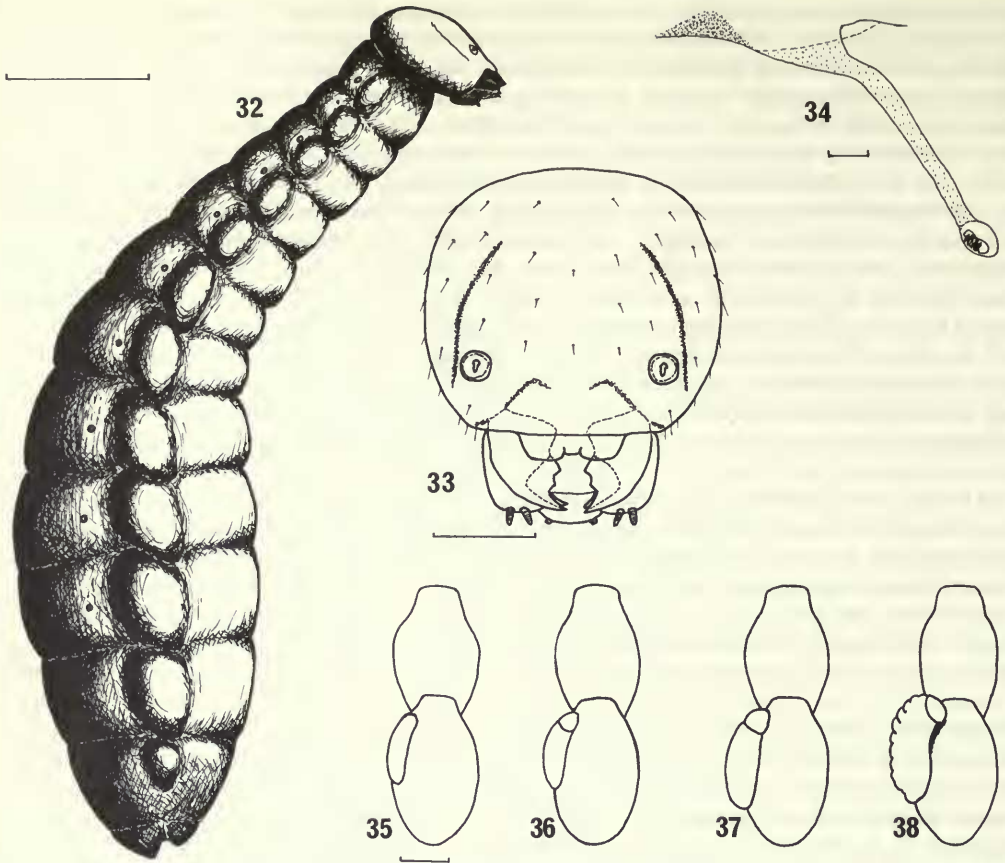
I have also observed *P. cinereus* in South Wales, on dunes that form part of the Oxwich National Nature Reserve administered by the Nature Conservancy Council. On the 11 August, 1973, on a

hot day following heavy overnight rain, Mr G. Else captured a female *P. cinereus* which he realized had been carrying prey. We introduced the female to her prey (*Arctosa perita*) in a glass tube. At 12.55 the wasp picked up the prey by the pedicel, using her mandibles. She was liberated, and proceeded to walk forwards carrying the inert spider. After several hesitant attempts, the prey was temporarily buried in the sand, two legs just protruding, 4 m from the point of liberation. At 13.12, owing to encounters with further females, we lost contact with her. We returned to watch the prey; at 13.21 the prey was recovered by a wasp, moved 2 m east, and reburied. The wasp revisited the prey and scraped more sand over it a minute later. We were able to follow her this time; at 13.28 she began to excavate a burrow at an angle of 45°, the entrance facing towards the sun. Occasionally, the accumulated spoil at the entrance was pushed 2 or 3 cm further back. Digging progressed until the wasp had excavated a burrow which was a little longer than her total body length. The bulk of the medium was damp sand, only a thin surface layer having dried out. At 13.37 she flew off suddenly and was lost. Three minutes later a wasp alighted at the site of prey burial, and 'visited' the prey. At 13.42 a female returned to the burrow and continued excavation. Eight minutes later the wasp left the nest site and returned with the prey after three minutes; it was dropped 10 cm short of the entrance. She inspected the nest, returned to the prey, picked it up and ran straight in head first. Further excavations followed for a minute or so and then the wasp turned round and began scraping material from the walls and roof of the burrow. At 13.57 she flew off and returned. Closure was then completed and the sand in the burrow mouth compacted by hammering with the tip of the abdomen. The surface of the sixth tergum forms the contact surface and is provided with the modified hairs typical of species of the genus. The thorax is held rigid on the legs whilst the abdomen is used as a tamping organ articulating with the propodeum. The abdomen itself moves forwards and backwards and from side to side beneath the thorax, making rapid tamping blows. Internal muscular adjustments modify the length and form of the abdomen as the needs of the work dictate. Finally, the wasp was captured and the nest carefully excavated.

The burrow, about 5 or 6 mm in diameter, proved to slope at approximately 45° for 3 cm, and then descended vertically to a globular cell at a depth of about 7.5 cm in damp sand. The spider bore a glistening white egg, about 1.3 mm long, dorsolaterally on the left anterior face of the abdomen (Fig. 35). Since return to the laboratory was not immediately possible, the prey (which was recovering power of movement) was placed in a dummy cell formed in damp sand contained in a plastic-corked 7.5 × 2.5 cm glass tube. The decision to store the prey in this manner proved fortunate, for when the prey was re-examined at 10.00 on 13th August (44 hours after interment), it was found to be enclosed in a bag of sand grains, which was of sufficient strength and adhesion to permit the whole to be picked up and suspended. The bag was torn open with forceps and needle; the prey within still bore the intact pompilid egg. The spider was transferred to a solid watch glass provided with a thin layer of sand, and a sheet glass lid so that observations could readily be made. The spider walked about, but without the rapidity expected of normal individuals. Silk was continuously produced from the spinnerets, which in a very short time bound together the sand grains at the substrate surface.

At 14.50 on 14 August the pompilid first instar larva was observed feeding. The surface of the egg that had been cemented to the prey abdomen remained so, whilst the free portion had parted dorsally liberating the larva for an air-breathing existence. However, apart from having penetrated the host integument with the mandibles, permitting the larva to suck in host blood, it had not moved, nor did it do so for some time during its development, until gross-feeding began. At 18.00 the larva had approximately doubled in volume (Fig. 36). By 10.00 of the 15th (Fig. 37) the head was distinct, the gut distended with orange-brown fluid; peristaltic feeding movements were observed. The lateral main tracheae were visible and small fat bodies developing. The third left femur of the spider was close to the larva and made contact when the spider ran, which it could still do in response to substrate-borne vibrations. At 18.00 the spider was still active, though the larva had grown considerably (Fig. 38).

On the morning of the 16 August at 10.00 the spider was moribund. The head of the larva was distinct, with scattered fine setae. Movements of the mandibles were clearly visible in addition to peristaltic movements. The feeding site had been changed from an anterolateral to an anteromedian position on the spider's abdomen. Prey and larva were transferred to a small glass vial so that more



Figs 32–38 *P. cinereus* development. 32, 33, mature larva, (32) right lateral view; (33) head capsule, frontal view. 34, nest and burrow, sectional view. 35, egg. 36–38, early instar larva, (36) 76 hrs from oviposition; (37) 92 hrs; (38) 99 hrs. Scale lines: 32, 34–38: 1.0 mm; 33: 0.25 mm.

complete observation was facilitated and so that an environment of appropriate dimensions was available should the larva survive to spin a cocoon. The larva was of a volume approximately equivalent to that of the shrunken abdomen of the spider. It was attached by its mid venter to the host, on an agglutination of dried host exudate and presumably an indeterminate number of cast larval skins.

At 16.00 the larva had consumed most of this material as a prelude to wholesale consumption of the host. By 23.00 the whole abdomen had been consumed, the larval gut was distended and it contained visible fragments of spider integument. At 09.00 on 17 August the two left rear legs had been eaten. The larva rested on its back and appeared to feed from a (? regurgitated) sludge borne on its own anterior thoracic venter. The remains of the cephalothorax of the host appeared to be held by the abdominal posterior of the larva. Eventually, the larva died without spinning a cocoon, having consumed all save the ventral and anterior faces of the host cephalothorax and appendages.

Three other *P. cinereus* were taken on 11 August with *Arctosa perita* as prey. Capture was observed once: a female pompilid observed a moving *A. perita* on the surface of the sand, rapidly traversed the 0.5 m distance separating them, and immediately grappled with and paralyzed the spider. On many occasions, however, female pompilids were seen to pass within touching distance of *A. perita* individuals which remained motionless and thus apparently undetected. Movement of the prey may be an essential releaser for prey capture on the surface. Bristowe (1948) records that *P. cinereus* individuals seek out *A. perita* individuals in their subterranean tunnels, however.

Following these successful observations, a return was made to Oxwich National Nature Reserve on 17 and 20 August. A female *P. cinereus* was found digging in dry sand near the top of a small partially vegetated dune at 12.50. Five minutes later she retrieved a temporarily buried spider which was carried forwards into the burrow. This sloped at 40°, the entrance facing the sun. At 12.58 the wasp reappeared at the entrance, turned and kicked out loose sand for a minute. A second, smaller, female entered the burrow, re-appeared and re-entered. Both then re-appeared and encountered a third female; all three circled and sparred swiftly, like dogs, for a few moments. The first female then re-entered her nest. Suddenly, at 13.16, the burrow roof collapsed; the female could be seen, partly buried, digging at the sand slip with mandibles and tarsal comb. She attempted a re-excavation, then flew off, investigated nearby burrows, and returned. The sequence was repeated several times until finally she no longer returned. I was unable to find the spider and speculate that the pompilid had not oviposited when disaster struck.

At 14.00 a female was encountered carrying prey. Temporary burial was effected, but the prey was subsequently recovered and re-buried one metre north-west of the original placement. The female was followed for a few minutes but I lost sight of it: I returned to the point at which the prey was buried. A female then arrived and began excavating at the base of a plant, 10 cm from the site of temporary burial. By 14.30 a burrow was completed and the female retrieved the spider. Six cm from the burrow she dropped the prey, inspected the burrow, returned to the spider and ran into the burrow head first. After 35 minutes with no sign of activity, I began excavation. The burrow was blocked at a depth of 3 cm by a thin wall of sand, behind which the pompilid and her prey were sheltering in a small cell. There was no evidence of further excavation, and no egg on the spider (*Cheiracanthium virescens*).

At 15.45 another female was found excavating. At 16.01 she left the nest and flew off several metres. At 16.07 a female appeared near the nest carrying an *A. perita* immature, which was dropped 1 m from the nest. The wasp visited the burrow, then returned for the spider, which was dropped in the nest entrance. She ran round the entrance, then followed the immobile prey inside. At 16.27 the roof of the burrow collapsed near the entrance, leaving a sand bridge. The wasp tore down more sand, executed a few brief 'tamping' movements with the abdomen, and flew off. She was captured and the burrow excavated. The spider was found at a depth of 5 cm directly below the entrance. Unfortunately, a pompilid egg attached anterolaterally on the left of the abdomen was damaged. The spider was placed in a glass vial, in which it soon began to exhibit signs of movement as paralysis wore off.

Since no further pompilid early stages had been secured during the day, the site was revisited on 20 August. At 13.35 a wasp was seen excavating; at 13.50 she flew off and returned with a spider, with which she ran head first into the nest. No spider was subsequently recovered, however. At 14.20 a wasp was encountered carrying prey, which was temporarily buried. I marked the burial site with a pair of sticks placed on the ground at a distance, each pointing towards the spider, intersecting at that point. The pompilid spent much time excavating trial burrows at various places. At 15.03 she returned to her prey, to discover it missing. I had last inspected it at 14.58; in the intervening period, the prey had been removed, most probably by another female *P. cinereus*. The original captor spent several minutes casting about at ever greater distance from the point of interment, but repeatedly returning unerringly to the exact site of original burial. Eventually, she flew off.

By this date *A. perita* seemed virtually to have been eliminated by the large pompilid population, which increasingly was utilizing *Cheiracanthium virescens* as prey.

A second abortive day seemed likely; in order to salvage something from the time spent, two female *P. cinereus* and two spiders (*C. virescens*) were captured and enclosed in a transparent glass, metal screw-top jar of about 10 cm diameter and 25 cm high. The bottom 8 cm were filled with slightly damp local sand. The *A. perita* individual excavated on 17 August seemed now almost normal in activity, and was also placed in the jar. The pompilid egg it bore was still attached to the abdomen but was flaccid and discoloured. The jar was placed in a bag and transported by car 200 miles to London during the evening. Overnight the bag was left in a darkened room. The jar was removed from the bag only at 09.30 the following morning, on arrival at the BMNH. One of the *C. virescens* individuals was not to be seen anywhere in the jar. The two female pompilids were in cells

just below the surface of the sand. One was moribund, but the cell was against the glass; the corpse was recovered. The second female emerged shortly afterwards. She seemed incapable of surmounting the overhang at the neck of the glass jar, and could not fly at a steep angle. Most time was spent in an endeavour to escape towards the window of the room. Accordingly, the blinds were drawn and a 75 watt lamp bulb was mounted to shine vertically downwards directly over the neck of the jar, from which the screw top was removed. Behaviour was altered instantly; the pompilid ran around and across her small arena exactly as in the field, whilst the two spiders remained immobile on the wall of the jar, which was covered by a mat of fine silk. Occasionally, the *Arctosa* (which of course was the individual which had already been used as provision by another pompilid, and still bore the remains of her egg) ventured onto the sand. On a few occasions it was run across by the pompilid, with no apparent reaction from the latter. Observations were interrupted for a period and when resumed at 14.00, the *A. perita* was immobile on its back on the sand, whilst the pompilid had just begun to excavate a burrow adjacent to the glass at an angle of 50–55°. The mandibles were used to loosen grains from the damp sand of the end face of the burrow; the tarsal comb was then employed in removal of spoil to the surface. After a few minutes work, the wasp fetched the spider to the burrow which had been excavated to a depth of 4 cm. Excavation then continued, with spoil being kicked over the prey which was soon 'buried' in the 'floor' of the burrow. At a depth of 8 cm the wasp enlarged the end of the tunnel somewhat to form a single cell (Fig. 34). The spider was then 'unearthed' and dragged into the cell, the wasp walking backwards and pulling on one leg of the spider with its mandibles. For a minute or so, the wasp manipulated the prey, turning it this way and that until finally she allowed it to rest with the head towards the nest entrance, venter down. The wasp adopted a position above the dorsum of the spider's abdomen, facing inwards from the soil surface, and extensively explored the spider's abdomen with its mouthparts. The remains of the previous egg were torn off and discarded or consumed. Eventually, the wasp reversed her position and agitatedly fussed over the prey until the tip of her abdomen was at about the mid-point of the spider's abdomen. She was quiescent for a brief period, then began rapidly to swing the tip of her abdomen back and forth around the upper girth of the prey abdomen, apparently maintaining contact all the while. After a number of such traverses, she ceased with her abdomen on the right-hand side of that of the spider. A few seconds later, she resumed more normal 'neurotic' pompilid behaviour, turning as if to inspect her handiwork. She then commenced immediately to tear at the roof of the burrow and pack the narrow tunnel with sand. When half back-filled, she scooped back material from the spoil heap with her tarsal comb, finally tamping the soil in the manner previously described, using the tip of the abdomen. The tunnel was not filled quite flush with the surface but was left as a shallow depression. By 17.15 the spider had resumed activity and could be seen to bear an egg on the right-hand side of her abdomen. Silk was being produced continuously.

Meanwhile, at 15.30 the remaining *Cheiracanthium* had been overcome and temporarily buried; unhappily, the moment of capture was missed in this instance also. The pompilid had previously encountered the spider, with no apparent reaction, on many occasions. A nest burrow was immediately excavated, on this occasion near the centre of the jar, curving clockwise as depth increased. The spider was recovered and carried in; the tunnel was back-filled and tamped down at 17.15.

On 24 August a first instar larva could be seen feeding on the abdomen of the spider in the cell against the glass. This individual was carefully removed, in its sand-silk envelope, from the sand of the jar. The observations made on the previous larva were repeated, with of course the exception that the feeding position was right antero-lateral rather than left. The larva was fully fed in five days and soon after spun a cocoon in a small glass vial. However, it died before completing the task, the body length about 6 mm, of typical pompilid form (Evans, 1959), with reduced second thoracic spiracle and tridentate mandible (Figs 32, 33).

Previously the rest of the sand had been removed from the container. The *Cheiracanthium* which was observed to have been provisioned was located in a silk-sand cell at a depth of 4.7 cm. The spider was active and bore a first instar pompilid larva antero-laterally on the right-hand side of its abdomen. Unfortunately the larva was injured in the process of excavation, and was thus preserved in alcohol. A third silk-sand cell found at a depth of 6 mm proved to contain the third spider, that

which mysteriously had disappeared during transit from original habitat to laboratory! It bore a damaged egg on the right-hand side of the abdomen, but walked out of its cell when the silk lining was torn open. It seems that all phases of behaviour exhibited by the pompilid, hunting, provisioning, ovipositing and cell closure must have taken place at night, without benefit of light, let alone warm sunshine! All three eggs laid by this female had been placed on the right-hand side of the prey abdomen.

These observations and those reported elsewhere may be summarized as follows. *P. cinereus* locates in the sand or encounters on the surface a prey individual which is stung into immobility. The prey is then transported by the wasp, which holds the prey in its mandibles and walks forwards. The prey may be held by pedicel, coxa or spinnerets. Occasionally a small wasp with large prey may need to walk backwards dragging the spider in order to clear an obstacle, after which reversion to forward prey carriage occurs. Large wasps with small prey individuals frequently jump or fly with prey. Most frequently the prey is temporarily interred whilst a suitable nest site is sought and a burrow excavated. Much time may be expended on trial burrows before a site is finally selected. The prey may be inspected or removed to a new site of temporary burial before burrow excavation is completed. When complete, the prey may be brought to the entrance, which is inspected before the prey is carried in, or the wasp may enter directly with prey, either forwards or backwards. Further excavation often takes place before the spider is carried finally into a terminal cell sufficiently large to accommodate wasp and prey. The egg is laid anterodorsolaterally on the prey abdomen. The burrow is then closed, the walls and roof being pulled in by the wasp's mandibles; the cell remains unfilled. Final closure includes more or less tamping of the soil with the tip of the abdomen. The prey recovers from paralysis between 3 and 6 hours after stinging and begins to walk aimlessly about the cell spinning silk continuously. After 3 days, when the wasp first instar is ready to emerge, the spider and wasp egg are contained within a silk-lined cell of considerable structural integrity.

Within these behavioural characteristics must be found most of the parameters which endow *P. cinereus* with the great success in terms of population size which it enjoys in suitable habitats. The production of silk by spiders recovering from paralysis has been recorded by Evans, Lin & Yoshimoto (1953) in the case of *Anoplius apiculatus*. This Nearctic species appears to occupy a niche broadly similar to that of *P. cinereus* in the Old World. Whether a complete cell lining is normally produced, however, is not clear. It seems probable, though I have no positive evidence, that the provision by the prey of such a cell lining is a significant factor in the relative success of *P. cinereus* in its preferred habitat. On the one hand it may serve to prevent collapse of the cell as the sand dries out, as frequently it might do at the shallow depth preferred by the species. Collapse of the cell would probably fatally injure egg or larva. An alternative strategy is exhibited by *Batozonellus fuliginosus* (Klug) which I have observed nesting in Black Cotton soil at Moremi, Botswana. An epeirid prey spider is temporarily suspended on an axil of some convenient leaf a few centimetres above the ground, whilst an initial burrow is excavated. The prey is often visited during this labour, but is eventually carried into the burrow. Further excavation then takes place, the spider is carried to the termination of the burrow and an egg deposited. Soil is then packed tightly around the spider so that it is totally supported by and in contact with sand; no discrete cell is discernible. The burrow is then back-filled and the entrance disguised at the surface. The prey recovered appeared to be deeply paralyzed.

The silk cell lining of *P. cinereus* may on the other hand serve to protect the prey from flooding during periods of rain. I have observed *P. cinereus* in abundance nesting on sandy river beds which had only recently ceased to carry water and which would shortly again do so. Unfortunately I have no evidence of the survival value of the cell lining in this situation. However, it seems likely that the sand-dwelling spiders on which *P. cinereus* preys are themselves adapted to survive periods of inundation protected by the silk linings of their burrows. Whether the lining serves only to maintain the integrity of the structure during flooding or may in some degree be impermeable to water is not clear. It is a very convenient facility for the pompilid to employ, utilising a faculty of the prey, engaged by gentle paralysis from which recovery is rapid. Light paralysis is of course normal in many genera of Pompilidae which construct no nest but leave spiders free-living before they succumb to their ectoparasitic larvae. Whether in the case of *P. cinereus* paralysis of the spider

causes its subsequent behaviour to be specifically modified or enhanced, or just marginally inhibited, is an open question.

Other factors probably of significance to the success of *P. cinereus* are its relatively long diurnal periods of activity and its tolerance of diverse climatic conditions. These, combined with behavioural flexibility and versatility, endow the species with many advantages over competitors. The catholic prey preferences (see Richards & Hamm, 1939, and records here quoted) together with acceptance of a wide range of prey size, must also be important. *P. cinereus* (and also *P. cadmius*) exhibit an exceptionally large adult female size range. For example, the largest and the smallest females from a series of *P. cinereus* taken in a single day at a single locality in Greece weighed 20.4 mg and 2.1 mg respectively. A difference in dry weight of virtually ten times is unusual even for species of Pompilidae, all of which so far as is known utilize a single prey individual per egg laid. Such variation is improbable in species of other families which exhibit multiple provisioning and can more readily regulate adult size. This tolerance of prey size is probably a beneficial factor, permitting a greater number of offspring to be left by larger females with no deleterious reduction in number by smaller females. Large females, for example, can readily overcome and transport small spiders which even if too small to succour a larva which will produce a future female can always produce a male individual. Large males are rare in *P. cinereus*, most being no larger than the small 2.1 mg female documented above.

Pompilid eggs, like those of other Hymenoptera, will be female when fertilized, male when not. In the haplo-diploid genetic system, the process of fertilization or its absence is the essential sex-determining criterion. The mechanism *per se* confers the potential for variation of the sex ratio, allowing the placement of eggs of suitable sex in relation to the available food resource. Thus, female eggs can be laid on large spiders and male eggs on small ones. No positive evidence is available to support these particular suggestions for Pompilidae, but the hypothesis accords well with the size distribution of the sexes observed in many long series of *P. cinereus* and with facts adduced for other Hymenoptera such as Ichneumonidae (Arthur & Wylie, 1959; Shaummar, 1966). It is thus quite possible that the sex of the egg of *P. cinereus* is determined in relation to prey size at the time of oviposition. The behaviour earlier described, in which the ovipositing female swings the tip of her abdomen around the contour of the prey abdomen within the cell may well be implicated in stimulating the female to fertilize the egg or to refrain from doing so. Such movements may give a measure of the size of the prey by means of mechanoreceptors detecting the angle at which the pompilid abdomen is deployed. Alternatively, some other part of the process of transport or provisioning may give an indication of total prey body size or weight. However, a mechanism which functions as nearly as possible just prior to the act of oviposition would seem likely to produce the most consistent results. In such a fashion, *P. cinereus* can effectively exploit to the full a wide range of available prey species in various stages of development, both immature and adult.

MATERIAL EXAMINED (1094 ♀, 368 ♂)

Sphex cinerea F., holotype ♀, **Australia** (Banks) (BMNH). *Sphex plumbea* F., holotype ♀, **Spain** (UZM). *Pompilus pruinosus* Smith, holotype ♀, **India** (East India Company) (BMNH). *Pompilus chevrieri* Tournier, lectotype ♀, **Switzerland?** (MHN). *Pompilus plumbeicolor* Dalla Torre, holotype ♀, **South Africa** (NMW). *Pompilus ithonus* Cameron, lectotype ♀, **India**: Deesa (C. G. Nurse) (BMNH). *Pompilus sericeibalteatus* Cameron, holotype ♀, **Tanzania** (*Sjöstedt*) (NR). *Sericopompilus bivittatus* Banks, lectotype ♀, **Philippines**: Mindanao, Iligan (*Baker*) (USNM). *Aporoideus clarus* Banks, holotype ♀, **Madagascar**: north-west, dry region, v.–vii.1938 (C. Lambertson) (ANS). *Pompilus plumbeus lusitanicus* Wolf & Diniz, holotype ♀, **Portugal**: Vila Nova di Portimão, 31.vii.1938 (*Zerny*) (NMW). *Pompilus plumbeus gotlandicus* Wolf, holotype ♀, **Sweden**: Farö, Sudersand, 17.vii.1944 (*E. Wieslander*) (NR).

To conform with editorial policy the data of the extensive material examined of this species are presented in an abbreviated form. Countries of W. Europe from which substantial material and published records (as *P. plumbeus*) are available are listed alphabetically without details of material examined. Localities are listed for the remaining parts of the range. Full data are given for specimens from type-series, and the full data of all specimens examined have been deposited in the Entomology Library of the BMNH.

Palaeartic region (345 ♀, 95 ♂)

Algeria: Bône [Annabal]; Biskra; Algiers, Maison Carrée (BMNH). **Austria**. **Belgium**. **Canary Islands**:

Fuerteventura, Corralejos; Coti; Lanzarote, Arrecife (BMNH). **Crete:** Georgiopoulos (BMNH). **Cyprus:** Limassol; Akrotiri Bay; Famagusta, Agios Memnos, dunes (BMNH). **Czechoslovakia. Denmark. Egypt:** 'Egypt'; Cairo, gardens and suburbs (BMNH); Assuan (Colln Wahis). **Finland. France. Germany (East). Germany (West). Great Britain. Greece:** Alexandropolis; Iliia, Olympia, ford; Alfios river mouth; Messina; Lamia, R. Aspos; Thessalia, Kalambaka; Kalambaka, Pinios riverbed (BMNH). **Hungary. Iran:** Mazanderan, coastal plain between Chalus and Shahsavar (BMNH). **Ireland. Israel:** Palmachin (BMNH). **Italy. Japan:** Osaka, Sumiyshiura; Imaimura, Niigata Pref.; Ryukyu Islands, Ishigakijima, Yarabuzaki (TMU; BMNH). **Libya:** 9 km S. of Tripoli; Tripolitania, Hon Oasis; Sabratha; Gagaresc; Zanzur; Fezzan, Brak (BMNH). **Luxembourg. Mallorca:** Paguera (NMB; BMNH). **Morocco:** Mogador [Essaouira]; Tassida, Souss Valley; Taroudant, Oued Souss; Oued Massa (Tiznit road); Sidi Ifni, coast; Agadir; Tangiers; Tetuan; Melilla, Ixmoart; Sidi Mesand (Colln Wahis; BMNH). **Netherlands. Norway. Poland:** Grabow; Olkusz; Wroclaw; Milicz (Colln Wahis; BMNH). **Portugal. Rumania:** Dobronjia, Constançe (BMNH). **Sardinia:** Oristano Tharros (BMNH). **Saudi Arabia:** Jeddah, Haddat, Ash Sham (BMNH). **Sicily:** Selimente (BMNH). **Spain. Sweden:** Fårö, Sudersand, 13–17.vii.1949, 1 ♀, 2 ♂; Gotland, 6.viii.1954, 1 ♀ (paratypes of *P. p. gotlandicus* Wolf) (NR). **Switzerland. Tunisia:** Tozeur; Djerba Island, Ras Torguiness; Tabarka (BMNH). **Turkey:** Kirklarelli Beach, N. of Igneada; Antalya, Kalediran, nr Gazipasa; Sinope; Samsun, Terme; Istanbul, Sile; Kayseri, Sultanhami; Sivas, Koyulhisar; Artvin, 20 km Yusufelli; Mersin, Alata (BMNH). **U.S.S.R.:** Daghestan, Zemeus (Colln Wahis); Kazakhstan, Kaskelen R., 50 km N. of Alma Ata (BMNH). **Yugoslavia.**

Ethiopian and Malagasy regions (560 ♀, 195 ♂)

Angola: Luanda; Lunda, Saurimo; Lunda, Nova Chavez; (CAS); Duque de Bragança Falls; Cachoeiras, 20 m. [32 km] SW. Gabela; Lobito; 12 m [20 km] SW. Luimbale; 5 m. [8 km] NE. Negola; 10 m. [16 km] NE. Acuala; 8 m. [13 km] N.E. Acuala; Sa da Bandeira, Tundavala; Porto Alexandre; R. Curoca, 7 m. [11 km] NE. Porto Alexandre; R. Giraul, 10 m. [16 km] NE. Moçamedes; Roçadas; (BMNH). **Benin Republic:** Malanville (BMNH). **Botswana:** Kuke Pan, 20°59'S, 22°25'E; nr Moremi Reserve, 19°27'S, 23°45'E; L. Ngami, 12 m [20 km] NE. Sehitwa; R. Semowane, 20°25'S, 26°23'E; Palapye; Ngamiland (BMNH). **Chad:** Tibesti, Bardai; Zonar (BMNH). **Ethiopia:** R. Hawash, S. of Adama; Harrar (BMNH). **Ghana:** Labadi (BMNH). **Ivory Coast:** Foro-foro (BMNH). **Kenya:** Marsabit (BMNH); Archer's Post, Uaso Nyiro River; Kwale, Diani Beach (CAS); Tiwi Beach, 40°14'S, 39°36'E (UZM); Usweni, Kitui (Colln Wahis). **Lesotho:** Mamathes (AM; BMNH). **Madagascar:** Tamatave (BMNH); Tananarive (CAS); Sombirano (MNH); Perinet; Isalo, Km. P. 713; Tulear Prov., St Augustin; Tulear, Beraketa (NHB). **Malawi:** Lingadzi; Domira Bay; Mlanji Boma; Mombera district; valley of Rukuru R.; between Rukuru and Florence Bay; Florence Bay to Karonga; Karonga; between Mvera and L. Nyasa; Mlanje; Shire Valley; Chitala Stream, 10 m. [16 km] W. Domira Bay; Zomba (BMNH). **Mali:** Labbezanga; Gao; Tillembeya (BMNH). **Mozambique:** Beira; Zambesi, Caia (BMNH); Lourenço Marques (Colln Empey). **Namibia:** 32 m. [51 km] SE. Ondangua; Windhoek, Eros Gorge; Swakop R., 3 m. [5 km] S. Okahandja; Okahandja; Khan R., 5 m. [8 km] N. Usakos; Swakopmund (BMNH; UZM); Walvis Bay (BMNH); 2 m [3 km] N. Seeheim (CAS); Gobabeb, Kuiseb R. (UZM). **Niger:** Say; Gaya; Belindi; Niamey (BMNH). **Nigeria:** Maiduguri; Zaria, Samaru; Michika-Bama; 30 m. [48 km] NE. Jos; Bonny; Ibadan (BMNH). **Oman:** W. Rafsah; Dhofar, Ayun Pools (BMNH). **Senegal:** Fatick (BMNH). **Somali Republic:** Senag Plain; Hargeisa (BMNH). **South Africa:** Transvaal, Morenski Dam; T., 5 m. [8 km] N. Warmbad; T., 5 m. [8 km] W. Warmbad (USNM; BMNH); T., Afguns (Hope); T., Letaba Reserve; T., Tshipise; T., Buffelspoort Dam; T., Vaalwater; T., Discovery; T., Ellisras (Colln Empey; BMNH); T., Pretoria North, sandpits (AM); T., Heidelberg (Colln Wahis); Orange Free State, Kroonstad; O.F.S., Chicago, Lindley District (AM; BMNH); O.F.S., Caledon R., Bethulie-Aliwal N. (SAM); Natal, Lake Sibayi (AM); N., St Lucia Estuary (CAS); N., Durban, Stellabush; N., Durban (BMNH); N., Durban, Brighton Beach; N., Reunion Rocks; N., Umbilo; N., Redhill; N., Umhlanga Rocks; N., Umhlali; N., Kloof; N., Escombe (AM; BMNH); N., Movo, N., Winklespruit (TM); N., Weenen, N., Malvern (BMNH); Cape Province, Upington (BMNH); C.P., Hartbeespoort Dam (TM); C.P., Lady Grey, 30.xii.1924; 6.i.1925 (3 ♀ paratypes *P. bilineatus*); C.P., Port St John's, Pondoland (BMNH); C.P., Port Alfred, Salt Vlei (AM; BMNH); C.P., Boesman's River, nr Grahamstown (SAM); C.P., Grahamstown, Belmont Valley; C.P., Howison's Poort; C.P., Table Farm; C.P., Hilton (AM; BMNH); C.P., Petersburg, Chunespoort; C.P., Port Elizabeth (NMR; BMNH); C.P., Algoa Bay, (TM; BMNH); C.P., Redhouse (NMR); C.P., Zwartkops; C.P., Humansdorp (TM); C.P., Jeffrey's Bay; C.P., Aberdeen; C.P., Beaufort West, Oukloof; C.P., Buffel's R., Ladismith; C.P., 8 m. [13 km] NE. of Touws R. (SAM); C.P., Mossel Bay; C.P., Montagu (BMNH); C.P., Bredasdorp (Colln Empey); C.P., Mordenaars, Karroo (SAM); C.P., Mitchell's Pass, 100 m. [160 km] Cape Town; C.P., Worcester; C.P., Moedverloor, Doorn R. (BMNH); C.P., Namaqualand, Klip Vlei, Garies, x.1931, 2 ♀ (paratypes of *P. bilineatus*); C.P., Hex River, xii.1884, 1 ♀ (paratype of *P. bilineatus*); C.P., Oliphants River between Citrusdal and Clanwilliam, xi.1931, 2 ♀ (paratypes of *P. bilineatus*); C.P., Oliphants River sources; C.P., Cold Bokkefeld; C.P., Bulhoek, Klaver-Clanwilliam; C.P., Citrusdal (SAM);

C.P., Ceres, xi–xii.1920–ii.1921, 35 ♀, 13 ♂ (3 paratype ♀ of *P. bilineatus*); C.P., Witzenberg Valley; C.P., Stellenbosch, iv.1924, 2 ♀ (paratypes of *P. bilineatus*); C.P., Die Panne Nature Reserve; C.P., Cape Town, Milnerton; C.P., Camps Bay, Cape Penin. (BMNH); C.P., Cape Penin., Witsands (NMR). **Southern Yemen:** Aden, Jebel Harir, Wadi Ma'Adin, 50 m. [80 km] WNW. Aden (BMNH). **Sudan:** Hag Zammam (BMNH). **Tanzania:** Kigoma; Tshilinda; Sukh Plains, foot of Sukh escarpment; Tanga; Zanzibar, Pemba Is.; nr Mazi Moja (BMNH). **Uganda:** Entebbe (USNM; BMNH). **Yemen:** Usafira, 1 m. [1.6 km] N. Ta'izz (BMNH). **Zaire:** Uvira; Albertville; Tshiefu, 5°34'S, 23°38'E; Abumombazi (BMNH); 13 m. [21 km] E. of Kenge (CAS); Parc National Upemba, Kasarabilenga, Mabwe, Parc National de Garamba; Musosa (Colln Wahis). **Zambia:** Ft Jameson; Karonga; Luwumbu Valley, Upper Luangwa R.; Upper Luangwa R., Mid-Luangwa Valley; Niamadzi R., Nawalia; Lower Luangwa R.; Luangwa to Petanke; Pakasa; Chirinda Gorge; Lusenfwa; 5 m. [8 km] up Lusenfwa; Chibuyak; SE. of Sjjiboda; L. Banguelu, nr Monfuli (BMNH); Lake Mweru, Chiengi (AM; BMNH). **Zimbabwe:** Salisbury, Chishawasha (BMNH); Bulawayo (Colln Empey); Sawmills; Umgusan (NMR); Umtali, ii.1917, 1 ♂ (paralectotype of *P. latilabris* Arnold) (BMNH).

Oriental region (104 ♀, 32 ♂)

Burma: Amherst (BMNH). **China:** Honan, Shanckow (Colln Wahis). **India:** Kashmir; Ranikhet, Kumaon; Deesa (BMNH); Mysore, Nandy Hills; Pondicherry, Karikal (Colln Wahis; BMNH; RNH); Karikal, Kurumbagarum (MCZ; BMNH); Madras, Coimbatore (Colln Wahis; BMNH; RNH); Tranquebar; Nedungadw, Tanjora (MCZ; BMNH); Karnataka, Mudigere; Honavar, sea level (UZM; BMNH). **Java:** W. Java, Mt Salak, 106°46'E, 6°40'S (RNH). **Laos:** Pak Neun (BMNH). **Pakistan:** Karachi (BMNH). **Philippines:** Negros, Cuernos Mts, 1 ♀, 1 ♂ (♀ paralectotype of *S. bivittatus* Banks) (USNM); same data, ♀ (paralectotype of *S. bivittatus*) (MCZ); Negros, Bacolod (RNH; BMNH); Mindanao, Agusan, San Francisco, 10 km SE. (BPBM; Colln Wahis; BMNH). **Sabah:** Papar; Tuaran (BMNH). **Singapore:** Changi; P. Tekong Kechil (BMNH). **Sri Lanka:** Leiden I., Mankuppam; Yala, Palatupana; Palatupana, WLNP Society Bungalow; Anu. district, Wilpattu Natl. Park; Panikka Wila Bungalow; Mannar (USNM; BMNH). **Taiwan:** (BMNH). **West Malaysia:** Negri Sembilan, Port Dickson (BMNH).

Australasian region (85 ♀, 46 ♂)

Australia: Australian Capital Territory, Cotter Res., 10 m. [16 km] W. Canberra; A.C.T., Pine Island Res., 10 m. [16 km] S. Canberra; A.C.T., Murrumbidgee R., near Canberra; A.C.T., Angle Crossing, 20 m. [32 km] S. Canberra (MCZ; BMNH); New South Wales, Bronlee (MCZ; BMNH); Northern Territory, Howard Springs, 16 m. [26 km] E. Darwin; N.T., Tumbling Water, 36 m. [58 km] S. Darwin; N.T., Elizabeth R., 25 m. [40 km] S. Darwin, N.T., Emily Gap, 7 m. [11 km] E. Alice Springs; N.T., Katherine and vicinity (MCZ; BMNH); Queensland, Mackay; Q., Kuranda; Q., Redlynch; Q., Caloundra; Q., Cape York; Q., N. Queensland; Q., Mid-Queensland (BMNH); Q., Yeppoon; Q., Newell Bch, nr Mossman; Q., Magnetic I., off Townsville; Q., Bribie I., 35 m. [56 km] NE. Brisbane; Q., Somerset Down, 70 m. [112 km] NW. Brisbane; Q., 18 m. [29 km] N. Cairns; Q., Coolum; Q., Kuranda and vicinity; Q., Gordonvale; Q., Cunnamulla (MCZ; BMNH); South Australia, Torrens River, near Birdwood, sandbank (MCZ); Western Australia, Flinders Bay (BMNH); W. A., Kununurra and vicinity (MCZ).

Pompilus mirandus (Saussure)

(Figs 1, 14, 19)

Ferreola miranda Saussure, 1867: 49, pl. 3, fig. 30. Holotype ♂ (not ♀ as originally stated), SRI LANKA (MHN) [examined].

Pompilus mirandus (Saussure) Dalla Torre, 1897: 302.

Pompilus ceylonensis Cameron, 1900: 77. Holotype ♀, SRI LANKA (UM) [examined] **Syn. n.**

Pompilus taprobanae Cameron, 1900: 78. Holotype ♀, SRI LANKA (UM) [examined]. **Syn. n.**

Pompilus singaporensis Cameron, 1901: 21. Holotype ♀, SINGAPORE (BMNH) [examined] **Syn. n.**

[*Pompilus ithonus* Cameron, 1908: 301; ♂. Missassociation of sexes; misidentification.]

Pompilus quinquefasciatus Laidlaw, 1938: 11. Holotype ♀, INDIA (RSM) [examined]. **Syn. n.**

F. miranda Saussure. The holotype was thought lost but I found it in a box of miscellaneous Pompilidae in the collections of MHN. It is extensively damaged and glued to a card; the abdomen is lost. However, the specimen is recognizable and agrees with the description. It bears labels 'Type', 'Trincomalee Ceylon', 'Ferreola miranda Ss ♀'; both description and figure-legend also interpret this male specimen as female.

♀. Length 5–13 mm. Black; with more or less extensive grey pubescence at least on antennal pedicel and flagellum, vertex, in front of hind margin of pronotum, centrally and laterally on mesonotum, on scutellum,

anterior portions of terga. Forewings hyaline or fuscohyaline, with infusate outer margin. Calcaria brown or grey. Temples and fore coxae with short erect fine hairs, fewer and shorter than those of *P. cinereus*. Sterna with few erect dark hairs.

Face broader below, narrowed above, more rounded than other species, often roundly produced above tops of eyes (Fig. 1). Clypeus transverse, labrum more or less concealed, not reflexed downwards. Pronotal hind margin angulate, sometimes weakly so, or arcuate. Postnotum transverse, similar to that of *P. cinereus*. Propodeum averaging shorter, squatter than *P. cinereus*, with a dorsal longitudinal impressed line. SMC 2 of forewing longer than SMC 3, second intercubital cross-vein more or less vertical (Fig. 14). Dorsum of sixth tergum with hairs not or only slightly modified as leaf-like scales, when so, only brownish or transparent, rarely obscuring surface of tergum. Fore metatarsus with three comb-spines and two inferior comb-spines; terminal tarsal segments with row of minute spines beneath; claws dentate.

♂ length 4.5–7.5 mm. Black; with more or less extensive grey pubescence, often more so than females from same locality. Temples with erect fine hairs.

Face narrow (Fig. 19). Distal antennal segments not noticeably thicker than proximal, middle segments thickest. Propodeum rounded behind, not strongly declivous, with ill-defined median longitudinal sulcus. Wing venation as female, SMC 3 often tending to triangular. SGP with few erect hairs, otherwise similar to *P. cinereus*. Tarsal claws dentate, uniform. Fore metatarsus with two comb-spines and one shorter inferior comb-spine; terminal comb-spine never exceeds half length of second tarsal segment.

This species has not previously been differentiated from *P. cinereus*, with which it sometimes coexists in the Orient; previous workers have recognized a single species. Most of the names both for *P. mirandus* and *P. cinereus* in this region have been the result of isolated descriptions rather than detailed faunal assessments. The species is morphologically the most generalized of the genus.

Females of the species are readily told when material of both is to hand from a single locality. In Malaya and Java, the shape of the face, the scales of the sixth tergum and the form of the wing venation are diagnostic. However, with some specimens from Sri Lanka, and most from western India, the generally darker appearance resulting from a reduction of grey pubescence and the brown or grey calcaria are more reliable. *P. cinereus* consistently has white or stramineous calcaria throughout the range of *P. mirandus*. Males of *P. cinereus* tend to be more grey pubescent and differ in shape of the face (Fig. 20) from *P. mirandus* males (see below under variation). The *P. mirandus* populations of the Indian subcontinent may eventually prove to be composed of two closely related species.

DISTRIBUTION. Pakistan to Sri Lanka, Burma, Malaya and Java; Map 1, p. 28.

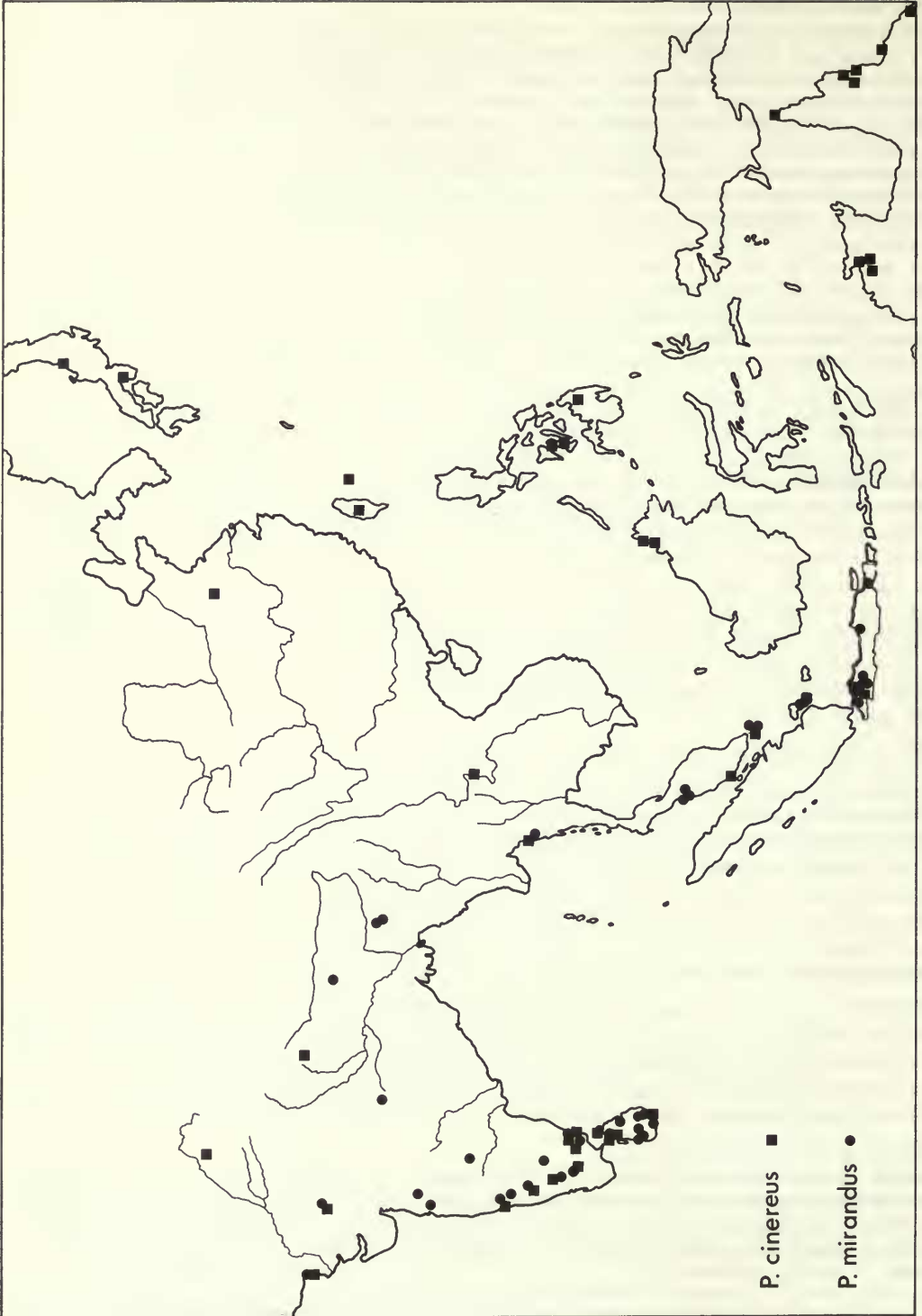
VARIATION. Females in NW. India are morphologically most similar to *P. cinereus*, but in the south and in Sri Lanka they develop the more characteristic shape of face and vertex (Fig. 1). Large individuals are more *cinereus*-like, however. The scales of the sixth tergum are reduced or even like normal pubescence throughout most of the range, particularly in Sri Lanka, Burma, Malaya and Java, though sometimes variable locally. Males are more difficult; the range of variation of *P. cinereus* and *P. mirandus* overlap, such that some individuals may be impossible to place. As stated above, strongly grey-pubescent, broad-faced specimens are placed as *P. cinereus*, less grey-pubescent specimens with narrow face and rounded vertex as *P. mirandus*.

BIOLOGY. No positive information is available. The species is tolerant of more vegetated habitats with higher rainfall than is *P. cinereus*, but is found only in drier forest regions with rainfall of up to 125 or so cm per annum. It is primarily a species of sandy soils, however, as are its congeners. Two of the few records for the genus of capture on flowers; a female taken by J. van der Vecht at Buitenzorg, Java, February, 1935; a male taken by R. L. Coe at Taplejung, Nepal, January, 1962.

MATERIAL EXAMINED (273 ♀, 101 ♂)

Ferreola miranda Saussure, holotype ♂, **Sri Lanka**: Trincomalee (*Humbert*) (MHN). *Pompilus ceylonensis* Cameron, holotype ♀, **Sri Lanka** (*Rothney*) (NM). *Pompilus taprobanae* Cameron, holotype ♀, **Sri Lanka** (*Rothney*) (UM). *Pompilus singaporensis* Cameron, holotype ♀, **Singapore**: x.1893 (BMNH). *Pompilus quinquefasciatus* Laidlaw, holotype ♀, **India**: Ranchi Behar, 1928 (*Laidlaw*) (RSM).

Burma: Tenasserim, Amherst Rd, 27–30.xii.1893, 2 ♀ (BMNH). **India**: Assam. Shillong, v.1903, 1 ♀; N. Khasia Hills, 1896, 1 ♀; Deesa, viii.1901–i.1902, 17 ♀, 2 ♂ (1 ♂ paralectotype of *P. ithonus* Cameron); Matheran, iii.1899, 1 ♀; Jubbulpore, v.1907, 1 ♀; Bombay, Nasik, 1 ♀, 2 ♂ (BMNH); Mysore, Nandy Hills, 15.iv.1970, 24 ♀, 11 ♂; Pondicherry, Karikal, i–iv.1962, 10 ♀, 1 ♂; v.1963, 1 ♀ (Colln Wahis; BMNH);



Map 1 Distribution of *Pompilus* species in Oriental and Australasian regions.

iii.1962, 6 ♀ (RNH); Nedungadw, Tanjora, v., 1 ♀, 1 ♂; Coimbatore, 6.ii.1950, 5 ♀ (MCZ); 1934, 1 ♀; 25.ix.-1.x.1979, 1 ♀ (BMNH); Nilgiri Hills, Gudalur, 3500' [1060 m], iv.1949, 1 ♀ (MCZ); Karnataka, Mudigere, 900 m, 2-10.xi.1977, 8 ♀, 2 ♂; Honavar, sea level, 24.xi.1977, 3 ♀, 1 ♂; Gersoppa, Jog Falls, 600 m, 19-24.xi.1977, 1 ♀; Bangalore, Allalsandra, 900 m, 26-29.x.1977, 1 ♀; (UZM; BMNH); Hyderabad, ix-x.1979, 1 ♀ (BMNH). **Indonesia:** Banka, Mesoel, 9.iii.1931, 1 ♂; Banka, Aerdengin, 20.ii.1932, 1 ♀, 1 ♂; Banka, Batoe Roesa, 28.xi.1935, 1 ♂; W. Java, Mt Gedeh, 800 m, Tapos, x.1932, 1 ♀; xi.1932, 2 ♀; xii.1932, 1 ♀; 6-11.iii.1933, 1 ♀; v.1933, 2 ♀; viii.1933, 1 ♀; 1-16.viii.1936, 1 ♀, 8 ♂; 250 m, Buitenzorg, Tjiboerail, xii.1936-i.1937, 7 ♀; Gunung Boender, 1.i.1936, 2 ♀; Buitenzorg, 240 m, on *Borreria latifolia*, 10.ii.1935, 1 ♀; Buitenzorg, Cultuertiun, 10.ii.1935, 1 ♀; 700 m, Gunung Megamendong, iv-vi.1936, 1 ♂; Res. Semarang, Djatingalih, vii.1939, 2 ♀; Niur?, Ujungkulon, 19.vii.1935, 1 ♂; Malang, Karangpleso, iv.1933, 1 ♀; Pajut, Preanger, xi.1914, 1 ♀; Djampang, Tjiajoenan, 100 m, 9.iii.1941, 1 ♀; Sindanglaja, 1200-1450 m, 3.ix.1934, 1 ♀; Batavia?, xi.1907, 1 ♀; Nonkadjadjar, viii.1935, 1 ♀; Gunung Tjampea, 250 m, 30.iv.1935, 1 ♀; Bantam, 11.x.1937, 1 ♀ (RNH, BMNH). **Nepal:** Taplejung District, Dobhan, 3500' [1070 m], on flowers, 23-31.i.1962, 1 ♂ (BMNH). **Pakistan:** Karachi, 1.v.1979, 1 ♀ (BMNH). **Singapore:** Linden Drive (sand), 8.xi.1976, 1 ♀; P. Tekong Kechil, 24.ix.1967, 1 ♀ (BMNH). **Sri Lanka:** Hambantota, 12.i.1908, 1 ♀; 4.x.1908, 1 ♀; 8.xi.1908, 1 ♀ (BMNH); Leiden I., Mankuppana, 23.x.1969, 1 ♀; Mandativu I., 23.x.1969, 6 ♀, 2 ♂; Columbo, Museum Garden, 28-31.i.1975, 9 ♀, 5 ♂; 15.i.1977, 4 ♀; 17-23.ii.1977, 3 ♀, 2 ♂; 14.vi.1977, 6 ♀, 1 ♂; iv.1977, 2 ♀; Columbo, 11-21.xi.1969, 1 ♀; Katanayaka, near airport, 16.i.1977, 9 ♀; Ratmalana airport, 19-21.i.1975, 7 ♀, 3 ♂; Teledeniya, 11.ii.1975, 1 ♀; Arupola, 27-29.x.1972, 4 ♀, 19 ♂; Uggalkaltota, 10-14.x.1970, 1 ♀; Nugegoda, Papiilyana, 3-4.v.1975, 1 ♀; Kokuwala, 6.vi.1976, 2 ♀; Kandy, Uddawattakele Sanctuary, viii.-ix.1976, 14 ♀, 3 ♂; Katanayaka, Uddawattakele Sanctuary, 30.ix.1976, 4 ♀, 1 ♂; Kandy, Hasalaka, 16-19.ii.1977, 2 ♀; Mon. district, 13 m. [21 km] E. Udawalawe, 16.vi.1976, on sand along Mau Aru, 14 ♀, 3 ♂; Mau Aru, 12 m. [20 km] E. of Udawalawe, 17-19.vi.1976, 3 ♀, 3 ♂; 10 m. [16 km] E. Udawalawe, 24-26.ix.1977, 5 ♀, 1 ♂; Ham. dist., Palatupana, 8-10.iii.1972, 7 ♀, 2 ♂; 10-12.viii.1972, 2 ♀; 2-6.ii.1975, 5 ♀, 7 ♂, Palatupana Tank, 28.ix.1977, 1 ♀; WLPNS Bungalow, 27-29.ix.1977, 1 ♀, 2 ♂; Anu. district, Padaviya, 18-21.v.1976, 5 ♀, 2 ♂; Wilpattu Ntl. Park, Panikka Wila Bungalow, 1.xi.1977, 1 ♀; Hunuwilagana, 22-26.v.1976, 1 ♀; Wilpattu Park, Talawila, 9-10.iv.1973, 1 ♀; Hunuwilagama, Wilpattu, 10-19.ii.1970, 1 ♀; Wilpattu, Mulikulara, Modaragam Aru, 13.vi.1975, 1 ♂; Man. district, Kokmotte Bungalow, 5 m. [8 km] NE. Wilpattu Natl. Park, 21-25.v.1976, 25 ♀, 2 ♂; Mannar, Olaithoduvai, 4-5.xi.1976, 1 ♀; Mannar, Silvatturai and Kondachchi, 24.i.1978, 1 ♀; Kondachchi, Maha, 28.i.1978, 1 ♀; Amp. dist., Panama, 50' [15 m], Raddela Tank, 14.vi.1976, 14 ♀, 2 ♂; Jaf. dist., 10 m. [16 km] S. Pooneryn, 24-26.i.1977, 1 ♀; Trincomalee, China Bay Ridge, Bungalow, 13-17.v.1976, 1 ♂; China Bay, 27-31.i.1977, 1 ♂; Tennamaravadi, 18.v.1976, 1 ♀ (USNM; BMNH). **West Malaysia:** Perak, Grik. K. Kendrong, 15.i.1962, 2 ♀; Penang, Pantoni Acheh, 26.xii.1958, 1 ♀; Penang, in hotel, 30.x.1960, 1 ♂; Ulu Klang, 25.viii.1929, 1 ♀; Dasun Tua, 5.viii.1929, 1 ♀; Serdang, 1 ♂ (BMNH).

Pompilus cadmius Saussure

(Figs 4, 17, 22, 29)

Pompilus cadmius Saussure, 1891: 266. LECTOTYPE ♀, MADAGASCAR (MNHN), here designated [examined].

Pompilus cadmius Saussure; Saussure, 1892: 363, pl. 8, fig. 20.

Psammochaeres latilabris Arnold, 1937: 47. LECTOTYPE ♀, MALAWI (BMNH), here designated [examined]. **Syn. n.**

P. cadmius Saussure. The original description applies quite well to three conspecific female specimens in MNHN. The largest female bears a label 'Madagascar. Grandid.' above a green label 'Pompilus cadmius Ss ♀ Madag.' in Saussure's handwriting. The second has the left forewing detached and glued to a card; it bears a determination label similar to that of the first specimen. The smallest specimen bears a label 'Madagasc. Grandidier' and again, Saussure's determination label. In 1892, Saussure referred specifically to three females collected by Grandidier. M. Wahis had already labelled these specimens as syntypes, and selected the largest as lectotype. I am in agreement with his selection; I have labelled and here designate as lectotype, the largest specimen.

P. latilabris Arnold. Arnold described from six females and a male from various localities and stated 'Types in the British Museum'. One female, from 'Between Mvera and L. Nyasa', and the male, from 'Umtali, both bear Arnold's red 'type' labels. A second female, from the Luangwa Valley, bears Arnold's green 'paratype' label, and is in NMR. Forty-eight additional females in the collections of BMNH bear locality labels consistent with the localities cited by Arnold. However,

four specimens only of this number each bear a small brown label, 'British Museum', of a kind used in the 1930's to identify Museum material on loan to other workers. I believe these to be the remaining syntypes. The six females are conspecific and belong to the species described below. The male is not conspecific with these females, it is a male of *P. cinereus* F.. I have labelled, and here designate as lectotype, the female specimen labelled 'type' by Arnold.

Pompilus cadmius has previously been regarded as a synonym of *P. cinereus* (as *P. plumbeus*).

♀. Length 6–13 mm. Black; extensively and very uniformly white-pubescent, save black on antennal flagellum and anterior margins of some sterna; posnotum devoid of pubescence. Terminal tarsal segments tending to a brownish colour; calcaria white or stramineous. Wings hyaline or fusco-hyaline, forewings with infuscate tips. With long erect white hairs on temples and adjacent areas of prothorax and fore coxae. Sterna with very few erect black hairs.

Face very broad below, narrowed considerably above, less so in Madagascan and South African specimens (Fig. 4). Malar space well developed adjacent to temples, less so adjacent to clypeus. Clypeus approximately 4.0 times as broad as high, margin slightly arcuate; labrum exposed. Temples well developed. Pronotal hind margin angulate, postnotum laterally about half length of centre of postscutellum, considerably narrowed centrally. Propodeum narrow and rounded posteriorly, with distinct dorsal longitudinal impression in midline. Venation of forewing highly characteristic, SMC 3 higher than SMC 2, second intercubital vein perpendicular, stigma large (Fig. 17). Sixth tergum with hairs very strongly modified as distinct, contiguous globular scales, obscuring most of dorsal surface of tergum, and also extending onto lateral surface. Fore metatarsus with three comb-spines and two inferior comb-spines. Terminal tarsal segments lack spines beneath except a few extremely minute spines proximally in some specimens.

♂ 5–8 mm. Black; extensively and uniformly grey-pubescent, save sometimes dark anteriorly on terga or sterna. With limited erect hair, mostly on temples.

Head broad, face broad (Fig. 22), malar space developed. Distal antennal segments usually markedly thickened. Propodeum rounded in profile, narrow behind, with a well-marked median longitudinal sulcus. Wing venation as female. SGP with few erect hairs. Tarsal claws dentate, uniform. Fore metatarsus with two comb-spines and one much shorter inferior comb-spine.

The female should readily be recognized by the form of the SMCs and of the face and clypeus; also the very uniform grey pubescence and stout globular spines of the sixth tergum which extend to its lateral face. Throughout the range of *P. cadmius*, *P. cinereus* has brown or grey-pubescent calcaria; thus, the white calcaria of *P. cadmius* are diagnostic. However, in the Sahel region, *P. cinereus* has white or stramineous calcaria. The males are difficult to separate from those of *P. cinereus*; the characters given in the key are adequate, but the species is more easily told when specimens of both species are available for comparison. Males of this species apparently are quite rare in collections.

DISTRIBUTION. Arid and semi-arid regions of South Africa, reaching Katanga and Tanzania; also similar areas of Madagascar; Map 2, p. 32.

VARIATION. Very substantial variation in size of the females occurs, by a factor of eight or ten body volumes. However, the species is otherwise fairly stable morphologically. Females from Madagascar and Cape Province have the upper face between the eyes noticeably wider than do females from the greater part of the range in Africa. The females from Cape Province have less grey pubescence and more strongly fusco-hyaline forewings.

BIOLOGY. Like *P. cinereus* in Africa, this is a species of coastal dunes, sandy beds of intermittent rivers, river banks and lake shores. It co-exists widely with *P. cinereus* and *P. irpex* wherever their ranges are coincident.

A female in the BMNH collected by Silverlock on 21.i.1911 at Pakasa, Zambia, is pinned with its spider prey, tentatively identified by F. R. Wanless as *?Pisaura* sp. This record is coincident with a similar record for *P. irpex*.

MATERIAL EXAMINED (109 ♀, 13 ♂)

Pompilus cadmius Saussure, lectotype ♀, Madagascar (*Grandidier*) (MNHN). *Pompilus latilabris* Arnold, lectotype ♀, Malawi: between Mvera and L. Nyasa, 12–21.x.1910 (*S. A. Neave*) (BMNH).

Angola: Porto Alexandre, 25.ii.1972, 1 ♀; 2 m. [3 km] N. of Moçamedes, 29.ii.1972, 1 ♀ (BMNH). Burundi: Bujumbura, 20.viii.1975, 1 ♀ (Colln Wahis). Kenya: Archer's Post, Ewaso Nyiro R., 2350'

[716 m], 6–12.xii.1969, 1 ♀, 1 ♂ (CAS). **Madagascar:** 2 ♀ (*Grandidier*) (paralectotypes of *P. cadmius* Saussure) (MNHN); Beraketa, 5.xi.1958, 2 ♀ (NMB: BMNH); Behara, iv. 1937, 1 ♀ (Colln Wahis); Tamatave, 1894, 1 ♀ (MNHN); 16.ii.1928, 1 ♂ (Colln Wahis); Bekily, region Sud de l'Ile, xii.1932, 1 ♀, 1 ♂ (MNHN). **Malawi:** between Mvera and L. Nyasa, 12–21.x.1910, 2 ♀ (paralectotypes of *P. latilabris* Arnold); same data, 11 ♀; Mlange, 12.vii.1913, 1 ♀; Karonga, 7–11.vii.1910, 2 ♀ (BMNH). **Namibia:** Onseepkans, Orange River, banks, 8–10.i.1972, 3 ♀; Okahandja, 2–4.ii.1972, 3 ♀; Swakopmund, 6–20.ii.1934, 5 ♀, 4 ♂ (BMNH); Kuis, Fish R., 1170 m, 7.v.1958, 1 ♀ (CAS); Fish River Canyon, 16–22.viii.1958, 5 ♀, 4 ♂ (AM; BMNH). **South Africa:** Natal, Weenan, 2840' [866 m] i.1924, 1 ♀; N., Zululand, Lower Umhlatuzi River, 4.v.1926, 1 ♀; N., Port St John's, Pondoland, 25–31.iii.1923, 2 ♀ (BMNH); N., Salt Vlei, Port Alfred, 25.i.1959, 1 ♀; N., Umhlanga Rocks, 17.xii.1944, 1 ♀ (AM); Transvaal, western, Ellisras, 6.iv.–19.vi.1962, 6 ♀, 3 ♂; T., Afguns (Hope), 7.xi.1962, 2 ♀; T., north-eastern, Letaba Reserve, 2.xi.1962, 1 ♀ (Colln Empey, BMNH); Cape Province, Moedverloer, Doorn River, 8.x.1975, 2 ♀ (BMNH). **Tanzania:** Kigoma, 17.viii.1931, 1 ♀ (BMNH); Mpala, 21.iii.1954, 1 ♀ (MRAC). **Zaire:** Parc National de Garamba, 16.viii.1957, 2 ♀; Kivu, Uvira, 16–23.iii.1953, 1 ♀, (MRAC); Uvira, 1958, 1 ♀ (USNM). **Zambia:** Pakasa, 23–26.i.1911, 6 ♀ (one with prey); 5 m. [8 km] up Lusenfwa, 20.x.1910, 1 ♀; Upper Luangwa River, 27.vii.–13.viii.1910, 1 ♀ (paralectotype of *P. latilabris*); same data, 13 ♀; Lower Luangwa River, 4–13.ix.1910, 2 ♀; Luwumbu Valley, Upper Luangwa River, 2500–3000' [762–915 m], 19–26.vii.1910, 6 ♀; Niamadzi River, near Nawalia, 17–22.viii.1910, 1 ♀ (BMNH); Chiengi, Lake Mweru, 31.i.1954, 4 ♀ (AM; BMNH). **Zimbabwe:** 96 m. [154 km] SE. Nuanetsi, 21°55'S, 31°30'E, iv.1961, 2 ♀ (NMR; BMNH); Sawmills, 22.xii.1928, 1 ♀ (NMR).

Pompilus bilineatus (Arnold) **comb. n.**

(Figs 5, 10, 18, 23, 26, 27)

Psammochares bilineatus Arnold, 1937: 50. Holotype ♀, SOUTH AFRICA (TM) [examined].

Arnold (1937) gave good figures of the significant characters drawn from the holotype specimen. However, all other specimens referred to this species by him are in fact misidentifications of the dark-pubescent Cape form of *P. cinereus*. The male has not previously been described.

♀. Length 8–14 mm. Black; extensively grey-pubescent, save black pubescence on antennal pedicel and flagellum, front and vertex, dorso-lateral patch on pronotum. Mesonotum, tegulae and scutellum black, with grey-pubescent lateral patches adjacent to parapsidal furrows, continuing backwards, expanding laterally over scutellum and postscutellum. Most of terga posteriorly and most of sterna grey with black anteriorly; a thin longitudinal line medially is black. Undersides of tibiae and tarsi and distal tarsi dorsally, black. Calcaria brown. Wings hyaline, outer margin of forewing infuscate. Face and fore coxae with few erect hairs, temples with many long erect hairs.

Face relatively high, narrow (Fig. 5), clypeus emarginate, labrum exposed but reflexed downwards towards mouthparts out of plane of clypeus. Pronotum angularly incised, postnotum rather less than half length of postscutellum, little narrowed medially. Propodeum with a well-marked dorsal longitudinal median impression, with a small but distinct, flattened, sloping posterior declivity with flattened corners. Stigma small: forewing venation as in Fig. 18. Dorsal surface of sixth tergum with hairs strongly modified as distinct globular leaf-like scales, black, obscuring most of tergal surface. Fore metatarsus expanded laterally, with three comb-spines and two inferior comb-spines. Apical metatarsal comb-spine distinctly longer than second tarsal segment. Terminal tarsal segments with row of minute spines beneath.

♂. Length 8–10 mm. Black; extensively grey-pubescent, of pattern closely similar to that of female; erect hairs as in female.

Head subquadrate, face narrow, eyes broad, malar space well developed (Fig. 23). Antennal segments tapering distally, not expanded (Fig. 27). Propodeum long, with a definite median sulcus, declivity quadrate and flattened. Forewing venation as female. SGP with very few erect hairs. Tarsal claws of foreleg asymmetric, of others semibifid (Fig. 26). Fore metatarsus with two comb-spines and one inferior comb-spine of similar length.

The female is best recognized by the characteristic forewing venation and the shape of the face, particularly the reflexed labrum. The male claws and antennae render it readily recognizable.

DISTRIBUTION. Kalahari sand through dry Savannah to Ethiopia. This species has on occasion been taken in company with other species of its genus, but is also found well away from the normal habitat of its congeners. It is, however, much more rarely collected; Map 2, p. 32.



Map 2 Distribution of *Pompilus* species in Africa and Madagascar; *P. cinereus* omitted from central and southern Africa.

VARIATION. The holotype has less grey pubescence than most other specimens seen; however, the species appears morphologically to be very stable, with no readily discernible variation.

BIOLOGY. No information is available for this species.

MATERIAL EXAMINED (27 ♀, 6 ♂)

Psammochaeres bilineatus Arnold, holotype ♀, **South Africa:** Orange Free State, Bothaville, 18.i.1899 (*H. Brauns*) (TM).

Angola: 10 m. [16 km] NE. of Cacula, 5.iii.1972, 1 ♀; Roçadas, 30.iii.1972, 1 ♀ (BMNH). **Botswana:** near Moremi Reserve, 19°27'S, 23°45'E, 20.iv.1972, 4 ♀ (BMNH). **Ethiopia:** Harar, R. Errer, 20.v. 1948,

1 ♀ (BMNH). **Malawi:** 'Central Angoniland', Lilongwe district, 4000–5000' [1220–1525 m], 28.v.–2.vi.1910, 1 ♀; Fort Jameson to Dowa, 4000–4500' [1220–1370 m], 4–9.x.1910, 1 ♀; NW. Shore of L. Nyasa, from Florence Bay to Karonga, 1650' [500 m], 30.vi.–6.vii.1910, 2 ♀; 'Nyasa', 1901, 1 ♀ (BMNH). **Namibia:** Okahandja, 2–4.ii.1972, 1 ♀, 2 ♂; Swakop River, 3 m. [5 km] south of Okahandja, 7.iv.1972, 1 ♀ (BMNH). **South Africa:** Transvaal, NW., Ellisras, 7.x.1961, 1 ♀; 9.ii.1972, 1 ♀; 31.iii.1972, 2 ♀ (Colln Empey; BMNH). **Tanzania:** near Mazi Moja, 20.viii–ix.1924, 1 ♂ (BMNH). **Zaire:** SE. Katanga, Ngaye, xi–xii.1931, 1 ♀ (MRAC). **Zambia:** Mweru Wantipa, Mushesha, 13–15.i.1954, 3 ♀; Mweru Marsh, Muzombe, i.1955, 1 ♂ (AM: BMNH); Upper Luangwa River, 27.vii–13.viii.1910, 2 ♀, 2 ♂; on road, Fort Jameson to Lundazi, 4000' [1220 m], 7–14.vi.1910, 1 ♀ (BMNH). **Zimbabwe:** Castle Block, 20°57'S, 27°57'E, 4.iv.1931, 1 ♀ (NMR).

Pompilus botswana sp. n.

(Figs 6, 9)

♀. Length 8 mm. Black; pubescence substantially black, but grey on scapes, lower face and clypeus, temples and occiput, pronotum save a transverse black streak before the posterior margin; with narrow lateral streaks posteriorly on the mesonotum and between parapsidal furrows, expanding posteriorly on the scutellum, postscutellum, and dorsal and posterior surfaces of propodeum. First tergum with extensive lateral patches of grey, second and third with small postero-lateral patches, second and third sterna grey posteriorly; last three segments black. Fore coxa grey ventrally and laterally, mid coxa ventrally, hind coxa ventrally and dorsally. Outer and ventral surfaces of femora grey. For tibia entirely, mid and hind tibiae dorsally, grey. Metatarsi with some grey pubescence, otherwise tarsi black. Calcaria dark. Wings hyaline, outer margin of forewing infuscate. Face and coxae with few sparse, short, erect hairs, temples with many erect white hairs, abdominal venter posteriorly with a few strong erect dark hairs.

Head relatively broad, inner margin of eye strongly sinuous (Fig. 6). Clypeal emargination deep and narrow with a broad polished rim. Hind margin of pronotum angularly incised, Postnotum relatively long, approximately half length of postscutellum, very little narrowed medially. Propodeum elongate, rounded posteriorly in lateral profile, without distinct flattened declivity. Wing venation as for *P. bilineatus* (Fig. 18). Sixth tergum with pubescence strong, the individual hairs much thickened, backwards directed, but not modified to form distinct, globular leaf-like scales, and not obscuring surface of tergum. Fore metatarsus slightly expanded laterally, with three comb-spines, two inferior comb-spines and in addition one shorter spine inserted medio-ventrally between the two rows (Fig. 9). Otherwise like *P. bilineatus*.

♂. Unknown.

This species is closely related to *P. bilineatus*. The relatively unmodified hairs on the sixth tergum and the medial ventral spine on the fore metatarsus readily differentiate it. However, it is also a less robust species than *P. bilineatus*, with much more rich black pubescence, and is subtly different both in the form of the face and of the propodeum.

The trivial name *botswana* is here used as a noun in apposition.

DISTRIBUTION. The unique specimen on which this taxon is based was taken in the Kalahari, in an area from which many currently undescribed endemic species of Pompilidae are known to me; Map 2, p. 32.

BIOLOGY. Unknown.

MATERIAL EXAMINED

Holotype ♀, **Botswana:** 42 miles [67 km] west of Kalkfontein, 11–12.iv.1972 (*M. C. Day: BMNH Southern African Expedition*) (BMNH).

Pompilus irpex Gerstaecker

(Figs 7, 15, 24)

Pompilus irpex Gerstaecker, 1858: 511. Holotype ♀, MOZAMBIQUE (MNHU) [examined].

Pompilus irpex Gerstaecker; Gerstaecker, 1862: 486, pl. 31, fig. 3.

Pompilus pilosus Smith, 1879: 140. Holotype ♀, 'SOUTH AFRICA' (BMNH) [examined]. [Synonymy by Arnold, 1937: 48.]

♀. Length 10–24 mm. Black; sometimes pink on tarsi, extensively grey-pubescent, save black pubescence on antennal pedicel and flagellum; thin anterior band on second and third terga and whole of succeeding terga black. Postnotum devoid of pubescence. Terminal tarsal segments tending to a pinkish ground colour;

calcaria white or stramineous. Wings strongly flavo-hyaline, forewing with infusate tip. With long erect fine white hairs on face, vertex and temples, on fore coxae; also shorter erect white hairs on thorax. Sterna each with a few strong erect dark hairs.

Face very broad (Fig. 7), malar space well developed, greater than thickness of antenna, clypeus at least 3.5 times as broad as high, arcuate; labrum exposed. Temples strongly developed, frons depressed below anterior ocellus. Pronotal hind margin angulate, postnotum laterally half length of centre of postscutellum, narrowing considerably centrally. Propodeum narrow and rounded posteriorly. Wing venation as in Fig. 15. Sixth tergum with hairs strongly modified as distinct black globular leaf-like scales, obscuring most of surface of tergum. Fore metatarsus with three comb-spines and two inferior comb-spines. Terminal tarsal segments lack spines beneath except proximally in some specimens.

♂. Length 10–14 mm. Black; extensively grey-pubescent, as in female, but terminal abdominal segments also grey, not black; often with more black anteriorly on anterior terga. Much erect fine white hair, as in female.

Head broad, face as in Fig. 24. Malar space developed. Distal antennal segments tapering, as in *P. bilineatus*. Propodeum posteriorly narrowed, but posterior dorsal and lateral angles fairly acute. Wing venation as in female. SGP parallel-sided, with many erect hairs. Terminal segment of fore tarsus mildly asymmetric, fore tarsal claws asymmetric (cf. *P. bilineatus*), others mildly so. Fore metatarsus with three comb-spines, the proximal spine shortest, and one inferior comb-spine at least of length similar to the proximal comb-spine.

This large, yellow-winged species is readily recognized.

DISTRIBUTION. Arid regions and dry savannah from SW. Angola, the Transvaal and Mozambique to Katanga and the Rift Valley lake area of East Africa; Map 2, p. 32.

VARIATION. Little of note.

BIOLOGY. This species, like *P. cinereus* and *P. cadmius* in southern Africa, is a species of lake shores, sandy river beds and banks. It frequently co-exists with the other two species. However, I conjecture that it may be more typically a species of lake sides.

A female in BMNH collected in September by the Oxford Tanganyika Expedition, 1959, at Kasoge Camp, 2550' [770 m], on the Mahali peninsula, bears a label 'Burrowing on sandy path and dragging one of the large *Arctosa*-type beach spiders'. It is not clear whether forward prey carriage was employed, most probably not when observed. I have found no specimen of prey.

A female collected by Silverlock at Pakasa, Zambia, on 26th January, 1911 has pinned with it as prey an immature lycosid (det. F. R. Wanless). This record coincides with one for *P. cadmius*.

MATERIAL EXAMINED (135 ♀, 13 ♂)

Pompilus irpex Gerstaecker, holotype ♀, **Mozambique:** Tette (*Peters*) (MNHU). *Pompilus pilosus* Smith, holotype ♀, '**Southern Africa**' (*Coll. Chas. Livingstone during Dr D. Livingstone's Expedn*) (BMNH).

Angola: R. Curoca, 7 m. [11 km] NE. of Porto Alexandre, 26.ii.1972, 1 ♀; 2 m. [3 km] N. Moçamedes, 29.ii.1972, 1 ♀ (BMNH). **Burundi:** Rumonga, 800 m, 7.iii.1953, 1 ♀; Bururi, 1948, 1 ♀; Usumbura, 1934, 1 ♀ (MRAC); Bujumbura, plage des Cocotiers, 24.vii.–20.viii.1975, 3 ♀ (Colln Wahis). **Kenya:** Ukumbangi, Nzoi, 1.ii.1889, 1 ♀ (BMNH). **Malawi:** between Mvera and L. Nyasa, 12–21.x.1910, 9 ♀; Karonga, 7–13.vii.1910, 31 ♀, 5 ♂; Chittala Stream, 10 m. [16 km] W. of Domira Bay, 22–28.x.1910, 2 ♀; W. shore of L. Nyasa, between Domira Bay and Kotakota, 29.x.–3.xi.1910, 3 ♀; Lake Nyasa, Domira Bay, 18–21.x.1910, 1 ♀; Fort Johnston, 2 ♀; Chiromo, 1 ♀; L. Nyasa, Monkey Bay, 20.iv.1915, 1 ♀; Domira Bay, 12.iii.1915, 1 ♀; Lingadzi, near Domira Bay, 9.iii.1915, 1 ♀ (BMNH). **South Africa:** Zululand, Umfolosi River, 23.v.1922, 2 ♂ (BMNH); Transvaal, Gravelotte, Beacon Ranch, i.1966, 1 ♀ (AM); T., north-west, Afguns (Hope), 3.iv.1972, 3 ♀, 3 ♂; T., Ellisras, 6.iv.1962, 2 ♀; 16.xii.1963, 1 ♀ (Colln Empey; BMNH). **Tanzania:** Kigoma, 31.viii.1931, 2 ♀ (BMNH); Kigoma, ix.1918, 6 ♀, 1 ♂ (MRAC); Mahali Peninsula, Lupulunga Ralta, on beach, 31.vii.1959, 1 ♀; Mahali Pen., Kasoge, viii.–ix.1959, 2 ♀, 1 ♂; East Africa (German), 1892?, 1 ♀ (BMNH). **Zaire:** Luchinda Delta, Lake Mweru, 12.ii.1953, 1 ♀; 3–4.ii.1954, 3 ♀ (AM); Lake Tanganyika, 1 ♀; Kienge, 12.ix.1944, 1 ♀ (Colln Wahis); Baudouinville, 31.iii.1911, 2 ♀; Albertville, 7.ii.1933, 1 ♀; Stanley Falls, 1 ♀ (MRAC); Uvira, 1958, 1 ♀ (USNM). **Zambia:** Pakasa, i.1911, 5 ♀ (one with prey); Lusenfwa Gorge, 24.x.1910, 1 ♀; Upper Luangwa River, 27.vii.–13.viii.1910, 9 ♀; Mid-Luangwa Valley, 23–31.viii.1910, 7 ♀; Lower Luangwa River, 4.–13.xi.1910, 9 ♀; near mouth of Lusangazi river, 1–3.ix.1910, 2 ♀ (BMNH); Lake Bangeulu, near Monfuli, 2.x.1946, 3 ♀; Bangeulu District, 1946, 1 ♀; Lake Mweru, Chiengi, 11.i.1953, 2 ♀; 31.i.1954, 1 ♂ (AM). **Zimbabwe:** Sabi River, x.1939, 1 ♀; Gwanda, xi.1965, 1 ♀ (NMR).

Pompilus niveus Saunders

(Figs 8, 16)

Pompilus niveus Saunders, 1901: 549. LECTOTYPE ♀, ALGERIA (BMNH), here designated [examined].*Psammochares (Psammochares) plumbeus* forma *nivea* (Saunders) Haupt, 1927: 181.*Chionopompilus rabinovitchi* Priesner, 1955: 165. Holotype ♂, EGYPT (El-Azhar University) [not examined]. **Syn. n.***Pompilus niveus* Saunders; Priesner, 1960: 83; ♀.*Chionopompilus rabinovitchi* Priesner; Priesner, 1960: 83; ♂. [Suggested possible synonymy with *P. niveus*.]

P. niveus Saunders. Saunders described from five females. Four conspecific females in BMNH agree well with the description and bear compatible locality data. One bears a label 'niveus ES. Type' in Saunders's handwriting. A fifth syntype is housed in MNHN, received as an exchange between Ferton and Saunders. I have labelled and here designate as lectotype, the female bearing Saunders's type label.

C. rabinovitchi Priesner. I have not been able to examine Priesner's holotype, and I have seen no other specimens. However, Mr K. M. Guichard examined the type on my behalf in Cairo during May, 1978. He had with him for comparison females of *P. niveus* and North African *P. cinereus*, and a male of the latter. He is of the opinion that *C. rabinovitchi* is the male of *P. niveus*. Priesner's description (1955) is very detailed; I have summarized only the immediately obvious and useful characters in the following description.

♀. Length 8–11 mm. Black with light extremities; extensively whitish grey-pubescent, very thickly adpressed on head, thorax and abdomen. Postnotum lacks pubescence. Calcaria white or stramineous. Wings hyaline or lightly flavo-hyaline with lightly infuscate tips to forewing. Head, scape, thorax, coxae, femora, tibiae and abdominal venter with profuse fine erect white hairs.

Face as in Fig. 8; clypeus transverse. Labrum exposed, with central arcuate incision. Mandible narrow, sickle-shaped with tooth very much reduced. Malar space as long as antennal segments are thick. Pronotal hind margin angulate or angle arcuately rounded. Postnotum very narrow, narrowest in centre. Propodeum rounded in lateral profile, with slight longitudinal impressed line. Forewing venation as in Fig. 16. Sixth tergum with hairs modified as distinct, white or grey, flat, leaf-like scales, not wholly obscuring the dorsal surface of tergum. Fore metatarsus with three very broad, blade-like comb-spines and at least five inferior comb-spines. Terminal tarsal segments with a row of minute spines beneath.

♂. Length 7.5 mm. Black; tarsi tending to reddish; pubescence much as in female. Body with few erect white hairs. Antennae substantially thicker terminally; fore metatarsus with three lanceolate comb-spines and two inferior comb-spines. Claws simple.

Like *P. irpex*, this is a very distinctive species; it is readily recognized by the tarsal comb and profuse erect hair.

DISTRIBUTION. Sahara Desert; Map 2, p. 32.

VARIATION. The few specimens examined indicate morphological stability over the whole range. Although covering a substantial land area, the habitat is itself probably very stable.

BIOLOGY. Unknown. This species is apparently characteristic of dune systems; it would thus seem to occupy the niche in the Sahara which in the Namib desert is occupied by *Schistonyx atterimus* Arnold. Many of their morphological specializations are developed in parallel.

MATERIAL EXAMINED (15 ♀)

Pompilus niveus Saunders, lectotype ♀, **Algeria**: dunes, Biskra, 18.v.1893 (*A. E. Eaton*) (BMNH).

Algeria: Biskra, dunes, 17–18.v.1893, 4 ♀ (*A. E. Eaton*) (paralectotypes of *P. niveus*) (BMNH; MNHN); Biskra, 9.iii.1906, 1 ♀ (BMNH); Biskra, iv.1902, 1 ♀ (Colln Wahis); 'Sahara', El Oued, 9.v.1898, 2 ♀; Miaoued Ferzan à M. al Caid, 7.v.1898, 3 ♀; Tillis à Mela, 15.v.1898, 1 ♀; Blidet Ammor à Tillis, 14.v.1898, 1 ♀ (Colln Wahis). **Chad**: Tibesti, Dourzo, 11.iv.1953, 1 ♀ (BMNH).

Additional records. I have not been able to examine the material on which the following records were based by Priesner (1955: 165; 1960: 83). **Egypt**: Gebel Asfar, 12.xi.1933, 1 ♂ (*Rabinovitch*) (holotype of *Chionopompilus rabinovitchi* Priesner) (Al-Azhar University); Gebel Asfar (sand dunes), 30.v.1956, 3 ♀ (*Ali Hafez*) (Ain Shams University) (and NMW?).

Nomenclatural changes in genera other than *Pompilus*

Genus *ANOPLIUS* Dufour

Anoplus Dufour, 1834: 438. Type-species: *Sphex nigerrima* Scopoli, 1763, by subsequent designation (Van der Vecht & Menke, 1968: 120); ratified by ICZN Opinion 997, 1973.

Anoplus subsericeus (Saussure) **comb. n.**

Pompilus subsericeus Saussure, 1867: 60, pl. 3, fig. 39. Holotype ♀, CHINA: Shanghai (NMW) [examined].

Genus *BAMBESA* Arnold

Bambesa Arnold, 1936b: 421. Type-species: *Bambesa grisea* Arnold, 1936b, by original designation. *Guichardia* Arnold, 1951: 178. Type-species: *Guichardia macilenta* Arnold, 1951, by original designation.

Syn. n.

Bambesa grisea Arnold

Bambesa grisea Arnold, 1936b: 422. LECTOTYPE ♂, ZAIRE: Uele, Bambesa, xii.1933 (*H. J. Brédo*) (MRAC), here designated [examined].

Guichardia macilenta Arnold, 1951: 178. Holotype ♂, GHANA: Agogo, 30.i.1942 (*K. M. Guichard*) (BMNH) [examined]. **Syn. n.**

B. grisea Arnold. Described from a female and seven males: I have labelled and here designate as lectotype, a male which agrees with Arnold's figures.

Genus *AMBLYELLUS* **gen. n.**

Type-species: *Pompilus hasdrubal* Kohl, 1894

[*Amblyellus* Wolf, 1965: 29 (as subgenus of *Aporinellus* Banks). Nomen nudum.]

[*Amblyellus* Priesner, 1966a: 58. Nomen nudum.]

[*Amblyellus* Priesner, 1966b: 200, 206 (as subgenus of *Aporinellus*). Without included species].

[*Amblyellus* Priesner, 1969: 84 (as subgenus of *Aporinellus*). Unavailable under Article 13(b), *Int. Code zool. Nom.*]

[*Amblyellus* Wolf, 1970: 400 (as genus). Nomen nudum].

[*Amblyellus* Wolf & Diniz, 1970: 12, 23 (as genus). Nomen nudum.]

[*Amblyellus* Wolf, 1972b: 130 (as genus). Unavailable under Article 13(b).]

[*Amblyellus* Wahis, 1972: 727 (as genus). Unavailable under Article 13(b).]

[*Amblyellus* Wolf, 1975: 40 (as genus). Nomen nudum.]

The keys of Priesner (1966b), Wolf (1972) and the account of Wahis (1972) adequately define the genus.

The following nominal species are assignable to *Amblyellus*; Palaearctic species are listed chronologically, followed by Ethiopian. Specific synonymies are not here established. However, I believe *P. hasdrubal* to be senior available name for the European species currently called *A. obtusus* Gussakowski; whether the latter is a synonym of the former is not clear. Similarly, *P. vegrandis* is probably senior name for a single Ethiopian species.

Amblyellus hasdrubal (Kohl) **comb. n.**

Pompilus hasdrubal Kohl, 1894: 314. Holotype ♂, SPAIN: Barcelona Antiga (NMW) [examined].

[*Aporinellus hanibal* (Kohl) Priesner, 1969: 84, 85. Lapsus for *hasdrubal*.]

Amblyellus kiritschenkoi (Gussakowski) **comb. n.**

Sophropompilus kiritschenkoi Gussakowski, 1930: 80. Syntypes 2 ♀, U.S.S.R. (ZI) [not examined].

Amblyellus obtusus (Gussakowski) **comb. n.**

Pompiloides obtusus Gussakowski, 1935: 147. Syntypes 2 ♀, 3 ♂, U.S.S.R. (ZI) [not examined].

Pompiloides insidiosus Nouvel & Ribaut, 1958: 514. Holotype ♀, FRANCE: Bacarès, 22–26.vii.1951 (*P. M. Verhoeff*) (RNH) [not examined]. [Synonymy by Wolf, 1975: 40.]

***Amblyellus vegrandis* (Kohl) comb. n.**

Pompilus vegrandis Kohl, 1906: 110. Holotype ♂, SOUTHERN YEMEN: Aden, xii.1898 (*O. Simony*) (NMW) [examined].

***Amblyellus willowmorensis* (Arnold) comb. n.**

Psammochares willowmorensis Arnold, 1937: 51. LECTOTYPE ♀, SOUTH AFRICA: Willowmore, i.i.1902 (*H. Brauns*) (TM), here designated [examined].

[*Amblyellus africanus* Wahis, 1972: 727. Nomen nudum].

Arnold described *P. willowmorensis* from both females and males. I have labelled and here designate as lectotype the female labelled 'type' by Arnold, which agrees with his figures.

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